Gas Journal

FEBRUARY 5, 1936

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Editorial Notes

The B.I.F.

A WEEK next Monday sees the opening of the British Industries Fair, which will continue till Feb. 28. It is a period of importance for the Gas Industry, and it is good to know that the Gas Section of the 1936 Fair at Castle Bromwich is bigger and more representative than ever before. Apart from last year, when an experimental change of date for the holding of the Birmingham Section of this great British exhibition proved in the event unsatisfactory, our Industry has always supported the Fair, and the display has been in consonance with the magnitude of the Industry. For the first time at Castle Bromwich there will be a British Gas Federation Information Bureau, and the Federation has arranged a large industrial exhibit—and many will recollect how excellent a piece of educative propaganda was the Federation's working industrial exhibit at the Shipping Engineering and Machinery Exhibition at Olympia last autumn. It may be mentioned that these two stands at the Fair are the joint responsibility of the British Commercial Gas Association and the Society of British Gas Industries.

The efforts of the B.G.F. and of the manufacturers of gas plant and appliances who have taken space at the Fair in Birmingham will, we feel sure, be rewarded by a full measure of support from the personnel of our Industry. Specially important days are Feb. 25, 26, and 27, on which the Joint Gas Conference of the British Gas Federation will be held. The Conference constitutes a well worth while gathering and affords an admirable meeting ground for the exchange of views. The programme, reference to which we make in our news columns to-day, is a light one—an Address by the B.G.F. President, the Earl of Dudley, and appropriately enough a Paper by Mr. Dean Chandler, of the South Metropolitan Gas Company, on the uses of gas in trade and industry. This will be open to discussion. There are to be two luncheons. On the opening day of the Conference is the official Gas Industry luncheon; on the following day a luncheon at the invitation of the Birmingham Chamber of Commerce and the Fair Management Committee. The lightness of the programme is all to the good in that it will allow ample opportunity for those attending the Conference to examine the displays of the manufacturers. As in former years, official visits are to be paid to the Fair by the Joint Junior Gas Associations and by the Gas Salesmen, the dates arranged for these being Feb. 20 and 21 respectively. We look forward to large, enthusiastic, and profitable gatherings.

Another Electric Elysium

IN recent issues we have found it our duty to criticize the policy of certain local authorities who have endeavoured so to utilize their powers as housing authorities as to force electricity upon their tenants. It is not pleasant to have to allege of any local authority that it is not "playing the game," and we should have been glad to have had some evidence that such cases did not exist. Unfortunately this is not the fact, and indeed week by week evidence accumulates that in many cases gas undertakings which are in competition with local authority electricity departments do not get a fair deal.

At York the Electricity Department is to be allowed to wire Council houses during their erection, but no similar facilities are to be given to the Gas Company. At Guildford, where the Corporation are also Electricity Undertakers, the Gas Company is not to be allowed to supply the Westborough Estate at all. A scheme for an all-electric estate nicely cut and dried was submitted to the Council. No opportunity whatever had been given to the Gas Company to tender for any work in connection with the houses, and a resolution that such an opportunity should be given to the Company was defeated. The houses are to be furnished with electricity for lighting, cooking, and heating, although probably in compassion for the weaker brethren a coal fire is to be provided in the living-room and one bedroom. It may be surmised that the trade in oil and candles on the estate will be brisk! But tenants, at least so far as the Council is concerned, shall not be permitted to buy gas.

If a prospective tenant desires to take gas, the Corporation will graciously endeavour to find him premises elsewhere, but from the Elysium at Westborough he is, like the plague, to be excluded! "We wonder," stated the *Surrey Advertiser and County Times*, "what chance an applicant would have of a house if he declined one of those now to be erected because he desired to have gas as well as electricity."

We understand that special terms, not publicly disclosed, have played a part in the Council's decision to hand over this building scheme to its Electricity Department, though whether this would constitute an undue preference over other consumers of electricity and thus infringe the Electric Lighting Act does not seem to have been regarded as a question worthy of the attention of the Corporation. It is thus that the County Town of conservative Surrey treats one of the largest ratepayers and employers of labour in the Borough after many years of faithful and much appreciated service.

It is fortunate that corporations of this character can-

not over-ride the law as enacted by Parliament, and we trust that the Guildford Gas Company will take every step to inform the new tenants on the Westborough Estate that Parliament has given them the right to use gas for any or all purposes, should they so desire, and has in addition placed upon the Gas Company an obligation to give and maintain a supply of gas when called upon to do so. In other parts of the country it has invariably been found that tenants of Council houses in overwhelming numbers desire to use gas, and there is no evidence that Council tenants in Guildford differ from those in other parts of the country, whatever may be the idiosyncrasies of those by whom they are represented on the Council.

In Country Districts

THE Paper on the distribution of gas in country districts which was given by Mr. T. A. Wolfe, of the Tottenham and District Gas Company, to the London and Southern District Junior Gas Association deals with a pressing problem and is of much importance; and the Author must have felt well paid for his pains by the excellent discussion to which it gave rise. Above all, the contribution vindicates the policy of wisely planned physical amalgamation—the taking over by a large undertaking, possessed of financial resources, experienced technical staff, and live sales organization, of small adjacent undertakings handicapped in all these respects. This policy of physical amalgamation is of benefit to the good name of gas. Districts hitherto " isolated " are increasingly being provided with modern electrical service, and only modern gas service can cope with the competition thereby presented.

It is axiomatic that modern gas service must have as its foundation an ample supply, at all times, of gas of uniform quality; it is futile to plan sales campaigns without this basis. Many distribution systems, however—and this applies more particularly, perhaps, to the smaller undertakings—are not altogether happy legacies from the past. The Author of the Paper under review deals with the area previously supplied by the amalgamated companies of Waltham Cross, Hoddesdon, Ware, and Hertford, and the district of Hoddesdon provided a striking illustration of the difficulties under which small concerns labour in the struggle to cope with growing demands for gas by maintaining the distribution system in a serviceable condition. If, as Mr. Wolfe says, this was striking, the effect of the change of conditions wrought by modern methods backed by financial support was really startling. On a later page will be found a map which is a source of interesting study. In 1931, prior to the amalgamation, in order to maintain a pressure of 3 in. in a fairly densely populated area two and a third miles from the works it was necessary to work 28-in. pressure at the source of supply, a pressure loss of 25 in. occurring. Service governors were not employed, and this high pressure was thrown upon the consumers' appliances. The Tottenham Company, having acquired the undertakings, at once set to work to remedy this state of affairs, and the map we reproduce from the Paper gives a comparison, which speaks for itself, of the pressure conditions then and now.

Facilities for All

TOGETHER with all this reconstruction work, the sales organization of the Tottenham Company, which enjoys a well merited reputation for keen salesmanship and a capacity for keeping in touch with its consumers and also with the times, has been brought to bear on the added districts. The gas fitter and district man has been offered encouragement to push the sale of appliances; commission is given, not on a percentage basis of the cash value, but a definite sum per appliance. And in regard to commission, apart from its application to district representatives, the scheme has been found useful in shops and inns, where satisfied users of coke fires, water heaters, and so on, are persuaded to display showcards. Enquiries are forwarded to the local office, and are followed up, and where sales are effected as a result, commission is duly paid to the innkeeper or shopkeeper. Steps have been taken to keep all employees fully informed of new developments, and schemes of training for the staffs employed in the country districts have been arranged. We have emphasized in these columns the need for giving equal attention to the prepayment consumer as to the ordinary consumer, and equal facilities in the purchase of appliances. After all, prepayment consumers outnumber ordinary consumers by more than 2,000,000. Now, in the rural districts taken over by the Tottenham Company, prepayment consumers may hire-purchase appliances—gas fires, gas irons, coke fires—not generally included in the prepayment installation, by adjustment of the meter. In this connection Mr. W. A. Bishop mentioned what is being done at Croydon on the " pay-as-you-burn " theory, explaining that the increase of £38,000 in the sales of apparatus in 1935, compared with 1934, was largely the result of this plan. He mentioned, too, that the Croydon Company prefer to give an adequate rebate out of which to take payment of extra appliances, rather than to set back the meter for reimbursement. Their feeling is that the latter practice, if carried too far, may give rise to the idea that gas is expensive. Another item of sales policy with which we thoroughly agree is the inclusion of the fixing charge in the purchase price of the appliance. It is most annoying to a consumer who has ordered an appliance to have several people " drifting around "—an inspector, then the delivery man, and finally the fitter. This apart from the fact that " extras " are always irritating. Since 1932 the consumption in the added areas of the Tottenham Company has increased by 60,000,000 cu.ft., and the 1935 sales of appliances, at £19,000, were more than double those for 1932.

Progress in Australia

IN this issue we give a substantial extract from the Presidential Address of Mr. A. H. Smedley, of the Manly Gas Company, to the Australian Gas Institute—an Address characterized by a clear perception of the Industry's needs. The President strongly advocates the establishment of a National Gas Association of Australia —a proposal put forward two years ago—" to promote closer relations and co-operation in all branches of the Gas Industry and between the various producers of gas and its by-products in Australia and elsewhere." He sees the need for closer co-operation and better organization in the marketing of coke and tar, and a bolder policy in regard to the development of new loads for gas, particularly the hot water load. His own efforts in this direction at Manly call for praise. Rightly he emphasizes the importance of woman's place in the Industry, and asks for the formation of a body equivalent to our own Women's Gas Council. His comments, too, on electrolysis and customer credit are both interesting and suggestive. During the past two years there has been marked advancement in the Australian Gas Industry, due to individual effort by undertakings; it cannot be doubted, however, that progress would be accelerated by a preconceived policy of co-ordinated activity on a national scale.

Mr. Smedley, discussing the damage to gas pipes caused by stray electric currents, asks whether, if leakage of gas caused corrosion or erosion to the property of another

public utility, there would not be an immediate assessment of the damage so caused and the gas undertaking called upon to make good. And, he goes on, where electrical leakages are found to exist, the onus of proof as to the origin of the trouble should rest not with the gas undertaking but with the electrical authorities concerned, who should be compelled to adopt remedial measures without any cost to the affected undertaking. " The Gas Industry," he says, " is suffering a grave injustice in that it is called upon to meet repair and replacement costs due to circumstances beyond its control, but not beyond the control of those responsible for electric services." In brief, the latter should be compelled to ensure the proper flow and return of the current.

Corrosion of Mains

THE question of the corrosion of underground gas mains and services was dealt with at the same meeting of the Australian Gas Institute in an able Paper by Mr. T. W. Hughes, of the Australian Gas Light Company, who treats the problem from the aspects of both soil corrosion and the damage caused by stray electrical currents. He maintains that chemical analysis alone of a soil as a guide to its corrosiveness is not only futile but misleading. The physical nature, as affecting the ability of the soil to retain moisture and to cause unequal distribution of oxygen on the metal, is a far more important consideration than its chemical composition. Clays and shales readily retain water, while soils of a sandy nature permit any water falling on them to drain away. Mr. Hughes relates that experience of the Australian Gas Light Company's district bears out the contention that the greatest amount of corrosion is suffered by mains and services buried in clay and shale soils, which predominate in the area served by the Company. Relatively little corrosion takes place in the districts where the soil is sandy. On the other hand, contrary to the usually accepted belief that pure iron and wrought iron are superior to mild steel for small mains and services, experience of the Australian Gas Light Company shows that all three are equally prone to soil corrosion.

Copper Pipes

THE methods of mitigating electrolytic corrosion—the use of insulating joints, electrical drainage, booster drainage, shielding, and cathodic protection—are discussed by Mr. Hughes, as also is the use of copper pipe, which is considered to " be eminently suitable for service pipe construction," and has been successfully employed by the Metropolitan Water, Sewerage, and Drainage Board for several years. Pipes constructed of 14 S.W.G. copper are estimated to have a life 6·4 times that of black iron pipe having a wall thickness of $\frac{1}{8}$ in. The Author sets out a comparison between the annual cost of service pipes constructed of various materials.

A Paper given to the Pacific Coast Gas Association by Mr. F. A. Hough, Distribution Engineer to the Southern Counties Gas Company of California, testifies to the successful use of copper for mains and services laid in corrosive soils. Copper pipe has been employed by the Southern Counties Gas Company since 1926, and valuable experience has been gained. At the present time the Company has over 100 miles of copper pipe installed in almost every type of corrosive soil to be found in Southern California. These copper lines are connected at innumerable points to steel or cast iron mains, and some of the copper has been in the ground for nearly nine years in soils where previous experience has shown that 2 in. steel pipe protected with a hot asphalt coating without wrapping will last considerably less than nine years. Mr. Hough explains that the Company has yet to find a case where an appreciable loss of copper metal has occurred, or any evidence that the use of copper pipe has resulted in the accelerated corrosion of the steel or cast iron pipes to which the copper has been connected. Copper pipe is now being installed in all soils which are too corrosive to permit the use of bare steel. The cost of installing copper pipe, states the Author, is about equal to that of installing steel pipe, the difference in cost being a matter of cost of material. On balance, however, the Company is well satisfied with the economy of copper. The conclusion has been drawn that in many corrosive soils the rate of corrosion of copper is less than that of steel by an amount sufficient to justify its use for gas services and for 2 in. and 3 in. mains, provided internal corrosion is not a limiting factor. Another conclusion is that, from the viewpoint of both mechanical strength and soil corrosion resistance, a wall thickness of 0·065 in. is sufficient for copper gas mains and services up to 3 in. in diameter.

Forthcoming Engagements

Feb.

6.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. G. C. Pearson.

8.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Meeting at Darwen. Paper by Mr. J. A. Derbyshire.

8.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Meeting.

11.—BRITISH GAS FEDERATION.—Meeting of Exhibitions Committee, 28, Grosvenor Gardens, S.W. 1, 12 noon.

11.—N.G.C.—Central Executive Board Meeting, 2.30 p.m.

14.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Dr. F. J. Dent.

15.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Annual Social.

15.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Meeting at Perth.

15.—YORKSHIRE JUNIOR ASSOCIATION.—Short Paper Meeting at Bradford.

19.—B.C.G.A.—Executive Committee Meeting, 11.30 a.m.

20.—B.C.G.A.—Northern District Conference at Middlesbrough.

20.—JOINT JUNIOR ASSOCIATIONS.—Visit to B.I.F., Birmingham.

21.—B.I.F.—Joint Visit of Gas Salesmen.

22.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Meeting at Kingshill Colliery.

22.—WESTERN JUNIOR ASSOCIATION.—Meeting at Yeovil. Paper by Mr. T. W. Clapham.

25-27.—JOINT GAS CONFERENCE.—B.I.F., Birmingham.

Mar.

4.—MANCHESTER AND YORKSHIRE JOINT JUNIOR ASSOCIATIONS.—Visit to Leyland. Paper by Mr. R. L. Greaves.

5.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Lecture on Refrigeration.

7.—SCOTTISH JUNIOR ASSOCIATION.—Joint Meeting in Edinburgh. Paper by Mr. H. Kerr.

13.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. General Discussion. Evening.

14.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Annual Business Meeting. Address by Mr. D. Fulton.

15.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—Meeting at Swansea. Paper by Mr. D. E. Wilkins.

21.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Meeting at Bonnybridge.

21.—WESTERN JUNIOR ASSOCIATION.—Meeting at Cheltenham. Paper by Mr. J. H. Smith.

24.—ILLUMINATING ENGINEERING SOCIETY.—Dinner, Trocadero Restaurant.

Apr.

2.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. F. J. Bengough.

3.—B.C.G.A.—Annual Meeting of Gas Salesmen, Caxton Hall, S.W. 1.

4.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Annual Dinner. Paper by Mr. J. A. Speers.

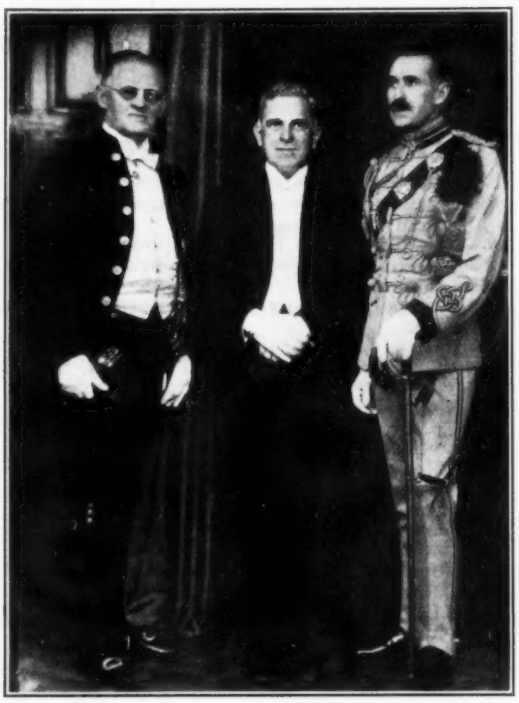
4.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Meeting at Hawick.

CORRESPONDENCE

An Episode of 1931

Bermuda. Sir Francis Goodenough, 39, Holland Street, Kensington, London, Eng.

Have just attended funeral services here for King George. As in America, people overcome with sorrow at England's loss. Your country fortunate to have so able successor as His Majesty King Edward. Thanks to you, in nineteen thirty-one I had unusual opportunity to observe his remarkable qualities. The regard in which he is held by all people assures stability of Government when such stability is paramount.—CLIFFORD PAIGE.



Sir Francis Goodenough, Mr. Clifford E. Paige, and Major Henderson-Scott in 1931.

SIR,—I have just received the above cablegram from Mr. Clifford Paige from Bermuda, where I know he takes a holiday each winter with Mrs. Paige.

His mention of 1931 refers to the fact that, when he came to this country that year and attended the meeting of The Institution of Gas Engineers in June, I was fortunate enough to have the opportunity of taking him to a Banquet given to the then Prince of Wales and his brother, then Prince George, to celebrate their return from a very successful tour in South America, and to have the privilege of presenting him (in conjunction with Lord Ednam—now the Earl of Dudley) to His Royal Highness, the Prince of Wales, after the Banquet was over. The Prince said: "Oh, Mr. Paige, President of the American Gas Association; then you would be interested in public utilities?" "Yes, Sir." "Then come and talk to me about them," and H.R.H. took Mr. Paige to a settee and engaged in conversation with him for about ten minutes. He then walked across with Mr. Paige to where I was standing and said: "I should like another talk with Mr. Paige. Will you please arrange to bring him to St. James's one morning this week?" with the result that, on the following Friday, Paige and I went to York House and had a full half-hour's audience with the Prince, at the end of which time, when Mr. Paige had left, I stayed behind to express thanks to His Royal Highness for giving me the opportunity of bringing Mr. Paige there.

Throughout the conversation the Prince had shown a very close knowledge of, and keen interest in, American affairs, and he said to me in reply to my expression of thanks: "I am only too glad to do anything in my power to further the good relations that happily exist between the United States and this country."

Subsequently I had the pleasure of securing for Mr. Paige an invitation to a levee which His Majesty King George was holding the following Monday, and a friend of mine took a movie film of incidents connected with that levee, including the King in his coach driving from Buckingham Palace to St. James's, and the Lord Mayor in his coach driving to the levee. A copy of the film was afterwards given to Mr. Paige, and he took it back to New York with him.

Anything I was able to do for Mr. and Mrs. Paige on their visit to this country was more than repaid to my wife and myself when we visited New York, Atlantic City, Washington, Boston, Toronto, Montreal, and Quebec the following October.

Yours, &c.,
FRANCIS GOODENOUGH.

28, Grosvenor Gardens,
S.W. 1,
Jan. 29, 1936.

Sir Francis Goodenough has received the following communication from H.M. the King's Private Secretary:

St. James's Palace,
S.W.
Jan. 30, 1936.

My Dear Goodenough,

I have shown Mr. Paige's cablegram to the King.

Perhaps when you are next writing to him you will say how much His Majesty appreciated its terms.

Yours very sincerely,
(*Signed*) GODFREY THOMAS.

PERSONAL

Rotherham's New Gas Engineer.

Mr. W. H. T. JOHNS, Assoc.M.Inst.Gas E., Deputy-Engineer and General Manager of the Burnley Corporation Gas Department, has been recommended for appointment as Gas Engineer and General Manager of the Rotherham Corporation Gas Department.

Mr. Johns is the elder son of Mr. W. H. Johns, the present Engineer and Manager of the Swansea Gas Light Company, who, during the war years, held the important position of Chief Engineer to the Sheffield Gas Company.

Mr. W. H. T. Johns was educated at King Edward Grammar School, Sheffield, the Swansea Grammar School, and Wrekin College, Wellington. His advanced technical studies were pursued at the Cardiff Technical College and the Swansea Technical College, and he was trained in practical mechanical, constructional, and general engineering in the shops and drawing offices of Messrs. Drakes, Ltd., in Halifax. He was an articled pupil of Mr. H. D. Madden, of Cardiff.

Appointed, on the completion of his articles, to the position of technical assistant (works and distribution) to the Swansea Gas Light Company, Mr. Johns there gained considerable experience in the designing and erection of gas plant. He later secured a position as Technical Assistant (works and distribution) to the Cheltenham and District Gas Company. For four years Mr. Johns served at Cheltenham before securing the position of Deputy-Engineer and General Manager of the Burnley Corporation Gas Department. In this capacity he has had special experience with the purchase of coke oven gas in bulk, and its consequent disposal.

Keenly interested in sport, Mr. Johns is an old Public School Rugby Football player, and continued his interest in the game by playing for Glamorgan Wanderers while at

Cardiff, and for the Old Patesians while at Cheltenham. In addition to his interest in Rugby football he is fond of swimming, and was a playing member of the Cheltenham Water Polo Club (second team).

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The Gas Light and Coke Company have appointed Mr. S. C. LESLIE as Publicity Manager in succession to Mr. A. P. Ryan.

Mr. Leslie has for some time been a senior executive officer of the London Press Exchange, Ltd., and a Director of Publicity Films, Ltd. He was an Australian Rhodes Scholar at Balliol College, Oxford, and subsequently held University posts in this country and at Melbourne. He returned to England in 1926 on the staff of Mr. Bruce, who was at that time Prime Minister.

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We learn from a local correspondent that Mr. RICHARD FARMER has been appointed Chairman of the Chester United Gas Company, in succession to the late Sir John Meadows Frost, and Mr. WILLIAM CULLIMORE has been elected to the position of Deputy Chairman.

* * *

At a meeting of the Directors of the Northampton Gaslight Company on Jan. 23 last, Lieut.-Colonel G. S. EUNSON was appointed Managing Director, and Mr. H. BANKS Engineer, to the Company. Mr. Banks has been with the Company for 35 years, and Assistant Manager since 1911.

* * *

On the occasion of his departure to take up a similar appointment with the Bradford Corporation, Mr. DAVID C. HENDERSON, Assistant Distribution Superintendent to the Perth Gas Department, was made the recipient of a handsome gift. Mr. David Vass, Engineer and Manager, in making the presentation, spoke of the universal high esteem and popularity in which Mr. Henderson was held. In acknowledging, Mr. Henderson remarked that the two years spent in the service of the Department would stand out as the happiest of his life. He thanked his Chief and the other members of the staff for all the assistance rendered to him and to all for their mark of esteem.

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At a gathering of the staff and employees of Shotley Bridge and Consett Gas Company presentations were made to Mr. and Mrs. JOHN BRUCE to mark Mr. Bruce's retirement after 45 years as General Manager. Mr. W. L. Little, Secretary to the Company, presided, and the presentations were made by Mr. J. Grant on behalf of the officials, staff, and inside workmen, and Mr. J. Smith on behalf of the outside staff. The Directors have already presented Mr. Bruce with an inscribed silver salver. Mr. Bruce has been succeeded by Mr. H. G. I. ANDERSON, who was trained at the Glasgow Corporation Gas Department and later served as Assistant Manager of Renfrew Gas Company.

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From the Jan. 30 issue of *World's Press News:*

So, within 12 months, Sir Francis Goodenough will join the ranks of the elder statesmen of advertising. He will be as young for that greyhound-sounding position as he is for his years, which are only 64.

Few men can have held a higher position—he has been Executive Chairman of the British Commercial Gas Association ever since it was formed 25 years ago—and have such a record of public work; it takes more than 40 lines of *Who's Who* to list his wide interests, which range from a Fellowship of the Institute of Fuel to Vice-Presidency of the Kipling Society, from Liveryman of the Worshipful Company of Gold and Silver Wyre Drawers—he is a Freeman of the City—to membership of the Commerce Degree Committee of the University of London, from Vice-Presidency of the London Devonian Society to Governorship of the Royal Free Hospital; in all, he is or has been connected with more than 30 public institutions of various kinds.

To us he is known mainly for his vigorous development of B.C.G.A. advertising—a model to the world—and his Presidency of the Incorporated Sales Managers' Association, not forgetting his work on Education for Salesmanship.

I'm glad to hear he's fully recovered from a recent threat to his health; may he live long as a young elder statesman!

Obituary

Alderman ROBERT HENDERSON HUME, who succeeded Alderman J. H. Lloyd as Chairman of the Gas Committee of the Birmingham Corporation in 1933, died on Jan. 25 at his residence, Priory Road, Edgbaston, from injuries received in a motor accident on the previous Tuesday night, when he was knocked down by a car near his home.

Alderman Hume was a schoolmaster by profession, but gave a great deal of time to commercial and public work, especially after his retirement. In November, 1920, shortly before his retirement from King Edward's School, he was elected to the Birmingham City Council as a representative of the Edgbaston Ward. He easily retained that seat until his elevation to the aldermanic bench in November, 1934.

Alderman Hume served on several important committees of the Birmingham City Council. For six years he was Chairman of the Technical Education and Evening Schools Sub-Committee; he was also Chairman of the Higher Education Sub-Committee. He was a life governor of Birmingham University and a governor of King Edward's School, which he served for one period as bailiff.

Yorkshire Junior Gas Association

Visit to Oldham

A meeting of the Yorkshire Junior Gas Association was held at Oldham on Saturday, Jan. 18, 1936, under the Presidency of Mr. J. W. CARLTON (Shipley).

By the kind invitation of Messrs. James Stott & Co. (Engineers), Ltd., the members inspected their Vernon Works at Oldham, where they were welcomed by Mr. R. E. Stott.

It was stated that the firm was established originally about 1870 by Thomas Stott for the manufacture of mercurial gas governors. It later branched out into gas lighting, heating, and ventilating, and in the early part of this century it was carrying out substantial contracts on these lines, having undertaken the complete gas lighting of several of the largest London theatres.

With the commencement of the European war the firm devoted its activities to the canteen equipment side of the business, and then, a year or two later, the hotel and restaurant equipment, since which time it has concentrated largely upon the manufacture and supply of catering apparatus.

The party inspected the manufacture and assembly of the various types of Stott "Regula" water boilers, café sets, hotcupboards and carving tables, food and vegetable steamers, cooking ranges, tea infusing urns, toasters and grillers, bread or bacon slicing machines, ham cookers, milk sterilizers for milk bottles, churns, utensils, &c., glue liquifying cabinets, and mercurial gas governors. A prominent feature in the manufacture of these appliances was the use of "Staybrite" stainless steel. The testing of the appliances in the iron shops was demonstrated, and it was shown that complete charted temperature and time records were available for all the appliances despatched to purchasers. A very considerable amount of nickel and chromium plating is also done.

All copper parts coming into contact with drinking water and water boilers are heavily coated with pure block tin, while special attention is paid to the elimination of the hard water deposit in boilers. Great interest was shown in Messrs. Stott's "Masterset," the latest production in fountain boilers.

The members subsequently proceeded to the Committee Room of the Oldham Corporation Gas Department where a Paper was read by Mr. R. E. Stott. Extracts from this, together with a report of the discussion which followed, are published on other pages of this issue.

Amalgamation and Grouping

United Kingdom Gas Corporation, Ltd.

Close Brothers, Ltd., Secretaries of the United Kingdom Gas Corporation, Ltd., announce that the Corporation has recently acquired 85·25% of the New Consolidated Stock of the Harrogate Gas Company, 86·64% of the 10% Original Shares and 87·45% of the 7% Red Scrip Shares of the Ramsbottom Gas Company, and 89·71% of the Ordinary Share Capital of the Quakers' Yard Gas and Water Company, Ltd.

News in Brief

Among Those Who Have Petitioned against the Buckhaven and Methil Burgh Extension Provisional Order is the Kennoway and Largo Gas Company.

Applications are Invited for the position of Manager to the East Dereham (Norfolk) Urban District Council Gas and Water Departments. Further particulars of this post are given in our advertisement columns to-day.

A Reduction in the Price of Gas is announced by the Cork Gas Consumers' Company as a result of improved workings and the withdrawal of the Coal Tax by the Free State Government. There was no increase in price when the Coal Tax was applied.

Application is Intended to be made to the Board of Trade under the Gas Undertakings Acts, 1920 and 1934, by the Chelmsford Gas Department for a Special Order authorizing them *inter alia* to purchase additional lands for the purposes of the Gas Undertaking.

We Have Received from the Society of Incorporated Accountants and Auditors a copy of their Year Book for 1936, which contains full particulars of officers, committees, and members, together with by-laws, regulations, and other useful information concerning the Society.

An Interim Dividend at the rate of 6s. 6d. per share, payable in Melbourne on Feb. 14, has been declared by the Directors of the Metropolitan Gas Company of Melbourne. We are obliged to the agents of the Company, Messrs. John Terry's, 296, Regent Street, W. 1, for this information.

"**Town Gas for Vitreous Enamelling**" is the subject of a Paper by Mr. W. Dieterichs, A.M.Inst.Gas E., and Mr. Peter Lloyd, B.A., which will be presented at a meeting of the Southern Section of the Institute of Vitreous Enamellers to be held on Feb. 13 at British Industries House, Marble Arch, W. 1.

The Industrial Co-Partnership Association will hold its next monthly lunch at 12.50 p.m. on Feb. 6, when Mr. C. H. St. John Hornby, a Director of Messrs. W. H. Smith & Sons, Ltd., will preside, at the Holborn Restaurant. Mr. Ralph C. Hazell, Chairman of Messrs. Hazell, Watson, & Viney, Ltd., will speak on "Improving the Status and Security of the Worker."

An Extraordinary Meeting of the Seaham Gas Company has been called for Feb. 20 to approve a provisional agreement for amalgamation with the Sunderland Gas Company. Seaham has been lighted by gas for 100 years. Gas was supplied by Mr. Henry Smith, a chemist and druggist, until 1875, when the Seaham Gas Company was formed. Its present capital is £50,000.

So Popular did the cookery lectures given a few months ago by the Alliance and Dublin Consumers' Gas Company prove that a new series have been inaugurated in the theatre premises at D'Olier Street, which the Company maintains fully equipped. About two hundred housewives attend each lecture, the demonstrator being Miss Ball, of the Radiation Research Kitchens.

Following the Removal of the Coal Tax by the Free State Government the Alliance and Dublin Consumers' Gas Company immediately announced a reduction in the price of gas to have effect from the last meter readings in 1935. The reduction is equivalent to 5% of the 1935 price and it is made by the Company despite the fact that gas prices in Dublin did not increase when the duty on coal was first introduced in 1932.

The Next Meeting of the Illuminating Engineering Society will be held by permission of the Council of the Institution of Mechanical Engineers at the Hall of the Institution, Storey's Gate, St. James's Park, S.W. 1, on Tuesday, Feb. 11, at 7 p.m., when Papers entitled the "Classification of Symmetrical Light Distribution" by Mr. H. Buckley, and "Thermal Tests for Illuminating Glassware" by Messrs. S. F. Dunkley and W. R. Stevens, will be given.

Improvements in the City Lighting were discussed at a meeting on Jan. 29 of Edinburgh Streets and Buildings Committee, when Mr. Norman G. Wilson, Inspector of Lighting, submitted a synopsis of the suggested 1936-37 programme. The total cost is understood to be £51,070. The Committee decided to recommend that the programme be approved generally and that a remit be made to the Convener and Officials to meet the Conveners of the Gas and Electricity Sub-Committees and the appropriate officials with a view to discussing the charges at present made for street lighting purposes.

Birmingham Increases Price of Gas

To Meet Additional Cost of Coal

The price of gas is to be increased in Birmingham. The Birmingham Gas Committee agreed as a voluntary concession to pay an additional 1s. per ton on the coal contracts it had entered into for coal. The Committee's concession is in respect of all coal supplied since the beginning of the year.

Consideration has since been given to the increased cost the Department will have to meet, and a decision was reached that it is necessary to advance the price of gas by 1d. per 1,000 cu.ft. The Committee, however, decided that this increase shall apply not from the beginning of the year, but from the March reading of the meters.

There has been no change in the price of gas in Birmingham since June, 1933. The new scale of charges will be as follows:

Consumption per Quarter in One Premises for One Consumer Through Ordinary Meters.

	Per 1,000 Cu.Ft.	Per Therm.
	s. d.	d.
Under 5,000 cu.ft.	3 2	8·00
5,000 cu.ft up to 25,000 ,,	3 0	7·58
25,000 ,, ,, 50,000 ,,	2 11	7·37
50,000 ,, ,, 100,000 ,,	2 10	7·16
100,000 ,, ,, 500,000 ,,	2 9	6·95
500,000 ,, ,, 1,000,000 ,,	2 7	6·53
1,000,000 ,, ,, 2,000,000 ,,	2 5	6·11
2,000,000 ,, ,, 3,000,000 ,,	2 3	5·68
3,000,000 ,, ,, 4,000,000 ,,	2 2	5·47
4,000,000 ,, ,, 5,000,000 ,,	2 1	5·26
5,000,000 ,, ,, 6,000,000 ,,	2 0	5·05
6,000,000 ,, ,, 7,000,000 ,,	1 11	4·84
7,000,000 ,, ,, 8,000,000 ,,	1 10	4·63
After the above scale has operated any gas in excess of 8,000,000 cu.ft will be charged at	1 9	4·42

The above prices are subject to 5% discount for prompt payment.

In the above-mentioned scale the total consumption will be charged at the rate in the scale applicable to the quantity consumed except in the case of the lowest rate of 1s. 9d. per 1,000 cu ft., which will only apply to the additional quantity of gas consumed in excess of 8 million cu.ft. per quarter.

Gas Supplied Through Prepayment Meters.

	Under Ten Years.			Over Ten Years.		
	Per 1,000 Cu.Ft.	Per Therm.	Per 1d.	Per 1,000 Cu.Ft.	Per Therm.	Per 1d.
	s. d.	d.	Cu.Ft.	s. d.	d.	Cu.Ft.
Meter only	3 0	7·58	27·78	3 0	7·58	27·78
Meter and fittings	3 3·66	8·35	25·21	3 0	7·58	27·78
Meter and cooker	3 4·56	8·54	24·65	3 3·66	8·35	25·21
Meter, cooker, and fittings	3 6·46	8·94	23·55	3 3·66	8·35	25·21
Meter and enamelled cooker	3 10	9·68	21·74	3 10	9·68	21·74
Meter, enamelled cooker, and fittings	4 1·66	10·45	20·14	3 10	9·68	21·74

The above-mentioned prices relating to prepayment meters are for consumptions up to 25,000 cu.ft. per quarter; the same reductions in price for quantity consumed will be given as in the case of the ordinary consumer.

1936 "JOURNAL" DIRECTORY

Page 14. BURY. W. H. Battersby appointed E. & G.M. vice H. Simmonds.

Page 42. LOSTWITHIEL. J. C. Cotterill appointed E. vice R. Morton.

Page 50. NORTHAMPTON. G. S. Eunson appointed M.D. and H. Banks, E.

Page 56. ROTHERHAM. W. H. T. Johns appointed E. & G.M.

Page 60. SHOTLEY BRIDGE. H. G. I. Anderson appointed E. & M. vice J. Bruce, retired.

Page 64. SOWERBY BRIDGE. W. B. Harrison appointed E. & M.

Page 80. BLACKFORD. Works permanently shut down.

Page 86. KELSO. J. G. Cuthbert appointed E. & M. vice P. R. Chalmers, retired.

Page 88. LANGHOLM. E. Shiell, E. & M., resigned.

Page 92. THURSO. E. Shiell appointed M.

THE ACCOUNTS OF

The Gas Light and Coke Company

Progress in 1935

The accounts of the Gas Light and Coke Company for the past year indicate a condition of continued prosperity. The Directors' Report states that the sales of gas have increased by over 1% on the previous year. There has also been an increase in the number of consumers of over 37,000 and an increase in the number of appliances sold or let out on hire of 167,000. As we should expect under such conditions the profits of the Company have been maintained. After the payment of the dividends for the June half-year there remains an available balance of £897,621, out of which the Directors recommend the payment of the dividends at the same rate as last year—viz., 4% per annum on the consolidated preference stock; 3½% on the maximum stock; and £5 12s.% on the ordinary stock. This distribution, which together with a further contribution of £20,000 for capital redemption, absorbs £694,998, leaves £202,623 to be carried forward to the next account, as against £183,068 brought into the account.

The gross expenditure on Capital Account for the year 1935 amounts to £1,362,040. Lands acquired accounted for £2,977, Buildings and Machinery £24,927, Mains and Service Pipes £290,235, Meters £367,109, and Stoves £676,792. The Capital Account is credited by a sum of £589,530—in respect of Sale of Land £5,201, Depreciation of Steamships £13,724, Depreciation of Meters £203,114, Depreciation of Stoves £367,491. The net capital expenditure during the year is therefore £772,510.

During the year £2,500,000 3% consolidated debenture stock has been raised which produced £2,337,500, or £93 10s. for each £100 stock issued. Under the capital redemption scheme of the Company £29,353 ordinary stock has been redeemed.

Comparison of the Revenue Account for the Two Years 1935 *and* 1934.

EXPENDITURE.

—	1935.	1934.
	£	£
Manufacture of Gas	4,931,914	4,750,572
Deduct Revenue from Residuals	2,119,280	1,974,141
Net Cost of Gas Making	2,812,634	2,776,431
Distribution of Gas	3,423,196	3,378,294
Public Lamps	124,422	117,812
Rent, Rates, and Taxes	705,751	769,451
Management	456,508	463,425
Copartnership	115,208	110,206
Annuities and Superannuation	243,040	217,371
Expenses *re* Issue of Debenture Stock	43,429	..
Other Miscellaneous Charges	122,102	116,235
	£8,046,290	£7,949,225

RECEIPTS.

—	1935.	1934.
	£	£
Gas Rental	8,403,295	8,331,051
Meter ,,	402,240	401,899
Stove ,,	742,861	685,113
Fittings ,,	516,822	505,324
Miscellaneous Receipts	52,310	51,954
	£10,117,528	£9,975,341
Gross Profit	£2,071,238	£2,026,116

—	1935.	1934.
	£	£
Appropriations for—		
Dividend and Interest	2,011,682	1,989,176
Capital Redemption	40,000	40,000
	£2,051,682	£2,029,176
Surplus	£19,556	£3,060 Deficit

Comparative Statement of the Principal Workings.

[Per Therm Sold.]

—	1935.	1934.
	d.	d.
Gas, Meter, Stove, and other Rentals	9·392	9·450
Residuals	1·992	1·892
Total Income	11·384	11·342
Coal, Oil, &c.	3·077	3·136
Net Coal	1·085	1·244
Works Charges	1·558	1·418
Net cost of Gas Making	2·643	2·662
Distribution Charges	3·217	3·239
Rates and Taxes	0·625	0·699
Management	0·429	0·444
Copartnership	0·108	0·106
Other Charges	0·423	0·358
Total cost, *less* Residuals	7·445	7·508
Gross Profit	1·947	1·942
Total Charge for Capital	1·928	1·945
Surplus or *Deficit*	0·019	*0·003*

The principal differences on the two years' trading when compared are: Coal has cost £24,546 less, largely due to reduction in the quantity used, partly on account of the additional quantity of gas purchased during 1935, and partly due to improved carbonization. The revenue from sales of coke increased by £123,870, due to improvement in selling price, the revenue per ton being 21s. as against 19s. 5d. in the previous year. The receipts for Tar and Tar Products were increased by £11,280 and Ammonia Products by £18,687. £153,676 more was expended on Repair and Maintenance of Works, and £109,249 more on Repair and Maintenance of Mains and Service Pipes. £89,563 less was expended on Repair of Meters and £13,885 less on Repair of Stoves. The charge for Rates and Taxes was reduced by £64,588. The cost of Annuities was £25,669 greater, and during the year an additional charge of £43,429 was borne in respect of the Debenture Stock issue.

Increased Revenue from Sales of Gas amounted to £72,244, although the average price received per therm was lower in 1935—*i.e.*, 7·898d. as against 7·986d. in 1934. Meter and Stove Rentals produced £58,089 more than in 1934. Rental of Fittings provided increased revenue to the extent of £11,498.

The expenditure for the year increased in total by £242,204, but on account of increased receipts from Residual Sales the net increase in total cost was £97,065 only. Gas, Meter, Stove, and Fittings Rentals and Sundry receipts improved in total of £142,187 resulting in an improvement in "Gross Profit" by £45,122. Charges for Capital were increased by £22,506, the final result being a surplus of £19,556, or £22,616 better than in 1934.

In connection with technical results, the cost of gas into holder for 1935 was 2·643d. as against 2·662d. in 1934, an improvement of 0·019d. per therm. The following figures give comparisons of makes per ton of coal carbonized:

	Year 1935.		Year 1934.
Coal Gas, Therms	76·39	..	76·62
Coke made for sale, cwt.	10·00	..	9·92
Coal Tar, galls.	10·54	..	10·39
Ammoniacal Liquor, butts (10 oz.)	26·85	..	23·61

Comparisons of Unit Costs and Values.

	1935.		1934.
	s. d.		s. d.
Coal, cost per ton	19 9·01	..	19 10·04
Oil, cost per gall.	0 3·26	..	0 3·13
Coke, revenue per ton	21 0·19	..	19 5·31
Tar and Tar Products, revenue per gall.	0 3·50	..	0 3·45
Liquor, revenue per butt (10 oz.)	0 6·64	..	0 0·71

Coal and Gas Oil Used.

	1935.		1934.
Coal Carbonized, tons	2,999,409	..	3,011,227
Gas Oil used, galls.	12,785,417	..	11,893,819

Gas Made—Therms.

Coal Gas (including Purchased)	232,117,614	..	229,038,200
C.W. Gas	35,644,802	..	35,510,609
Total	267,762,416	..	264,548,809

Statement of Gas Sales, Gas Used, and Gas Not Accounted For.

	1935. Therms.		1934. Therms.
Gas Sold, Consumer Sales	236,724,388	..	234,148,930
Sundry processes	12,345,384	..	9,668,333
Correction for Temperature, &c.	6,270,604	..	6,550,948
Total	255,340,376	..	250,368,211
Gas Used	1,768,870	..	2,626,254
Quantity not accounted for	10,653,170	..	11,554,344
or % of make	3·98	..	4·37

It is interesting to note that the sales for Public Lighting increased from 4,904,404 therms in 1934 to 5,287,079 therms in 1935 and the number of Public Lamps increased from 48,748 to 51,447.

Turning to the Balance-Sheet there is a balance at the credit of Capital Account of £569,037 as against a debit balance in 1934 of £995,953. The various funds have increased by the appropriate interest additions. As against a temporary loan from Bankers in 1934 of £725,000, there is £100,000 on Deposit Account. The amount invested in Allied Undertakings has increased during the year from £400,128 to £490,209. Stores on hand have increased from £2,332,803 to £2,476,919. Sundry Creditors from £3,977,384 to £4,992,954. This increase is practically wholly accounted for by Hire-Purchase and Deferred payment sales, the balance outstanding on this item alone having increased from £876,341 to £1,970,183, which shows the enormous amount of business done during the year in apparatus sales by this method, indicating the public's preference for new and improved appliances when offered under convenient purchase terms.

British Industries Fair—Birmingham

The Gas Section.

The decision of the Gas Industry to be officially represented again at the British Industries Fair, Birmingham, has resulted in a considerably increased demand for space from the manufacturers, and the Gas Section this year will occupy an area larger than ever before.

The British Gas Federation have undertaken the organization of an Industrial Exhibit and a Central Information Bureau.

The Industrial Gas Exhibit which is being arranged by the Technical Sub-Committee of the Joint Co-ordinating Committee, will be on more ambitious lines than any of its predecessors.

The Central Information Bureau will again occupy a prominent position in the Gas Section and will be adequately staffed to deal with the many and varied enquiries which are received both from members of the Industry and the public generally.

The Bureau will also contain the Office of the Hon. Secretary of the Gas Industries Section.

Joint Gas Conference.

The British Gas Federation is arranging the Joint Gas Conference which has proved such a successful feature of the Fair in past years, and it will be held this year on Tuesday, Wednesday, and Thursday, Feb. 25 to 27, under the Presidency of the Earl of Dudley, M.C.

The first day's proceedings will open with a Welcome by the Lord Mayor of Birmingham at 11.30 a.m., followed by the Presidential Address and afterwards the official Gas Industry Luncheon.

On the second day a Paper on " The Use of Gas in Trade and Industry " will be presented at 10.30 a.m., and it is hoped that people outside the Industry who are interested in the subject will be present at this session. This will be followed by a Luncheon at the kind invitation of the Birmingham Chamber of Commerce and the Fair Management Committee.

The Joint Gas Conference Committee is constituted as follows:

INSTITUTION OF GAS ENGINEERS.
Colonel W. M. Carr (Stretford). Stephen Lacey (G.I.C.C.).
W. E. Price.

SOCIETY OF BRITISH GAS INDUSTRIES.
D. M. Henshaw (W. C. Holmes & Co., Ltd.).
R. J. Rogers (Parkinson Stove Co.).
Thos. Allen (Gibbons Bros., Ltd.).

B.C.G.A.
Sir Francis Goodenough, C.B.E. W. J. Sandeman (Croydon).
A. W. Smith (Birmingham).

NATIONAL GAS COUNCIL.
P. N. Langford (Coventry). W. W. Townsend (Colchester).
H. C. Smith (Tottenham).

GAS COMPANIES' PROTECTION ASSOCIATION.
Dr. Charles Carpenter, C.B.E. (South Met.).
R. W. Edwards, J.P., C.C. (Aldershot).
F. J. Bradfield (Commercial).

JOINT JUNIOR GAS ASSOCIATIONS.
A. Hill (Birmingham).

GAS INDUSTRIES SECTION, B.I.F.
W. L. S. Spinks (Birmingham).

HON. SECRETARY OF COMMITTEE.
J. C. Walker (B.C.G.A.).

Official Visits.

Gas Salesmen will make their official visit to the Fair on Friday, Feb. 21, when they will be guests of the Birmingham Chamber of Commerce and the Fair Management Committee at Luncheon.

The Joint Junior Gas Association will visit the Fair on Thursday, Feb. 20.

Fuller details regarding these official visits to the Fair will be circulated in due course; but in the meantime it is important that those who wish to take part in these proceedings and require hotel accommodation should immediately make application to the Accommodation Department, at the British Industries Fair, Chamber of Commerce, New Street, Birmingham, stating what accommodation is required and whether a boarding house would be acceptable if hotel accommodation cannot be secured.

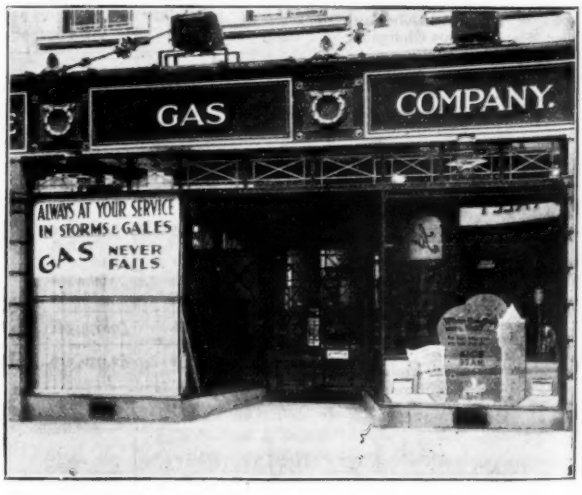
W. & B. Cowan

Newcastle Branch Opened

For the benefit of their many northern friends Messrs. W. & B. Cowan [incorporated in Parkinson & Cowan (Gas Meters), Ltd.] have opened new Works at 1, Charlotte Square, Newcastle-upon-Tyne.

This branch, we learn, has been developed as a result of increasing business in that area, and the Firm trust that by their efforts they may be successful in fostering the movement for the creation of new industries in the north.

Harrogate Takes Advantage of the Gale



During the recent gales one of the showroom windows of the Harrogate Gas Company was blown in, and the same evening there were two intermissions in the electricity supply. The following day the window appeared as in our photograph above. It speaks for itself.

Catering for Caterers

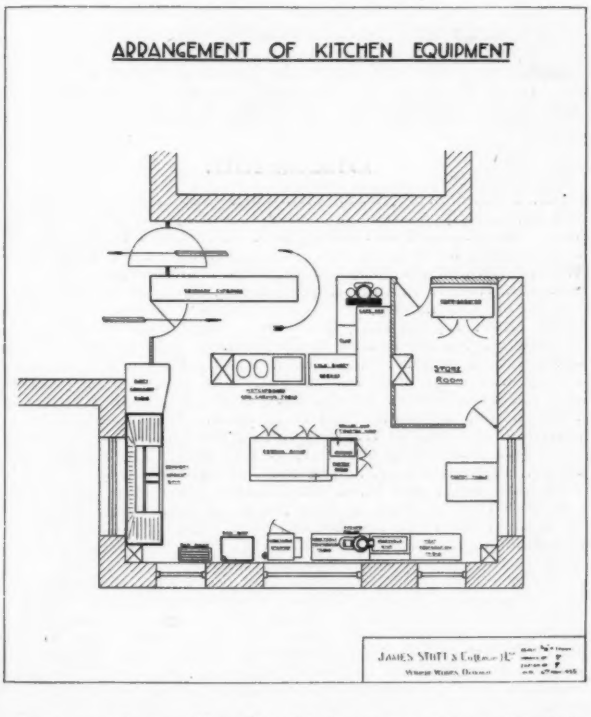
by
R. E. STOTT

From a Paper read before members of the Yorkshire Junior Gas Association at a meeting held at Oldham on Jan. 18 following an inspection of the Author's works, Messrs. James Stott & Co., Ltd.

In considering large-scale catering equipment we can roughly divide the types of premises to be fitted into four main headings:

(1) Hotel.
(2) Restaurant, including clubs and cafés.
(3) Institutions and hospitals.
(4) Works canteens.

Hotel catering is usually more or less continuous from morning till night. Restaurant catering is fairly continuous from mid morning only, with peak hours. Institutions usually mean very large-scale cooking at meal times only during the whole of the day. Canteen catering is usually cooking a large number of meals once a day, to be served in a very short time, and often has provision for the warming of a considerable number of brought dinners, besides which provision must be made to deal with the office staff, often separately.



Some people consider that kitchens are better situated on the top floor on account of ventilation; but in most cases this causes inconvenience in serving and in the handling of incoming stores. I consider a kitchen on the same floor as the restaurant very satisfactory, as adequate ventilation can usually be arranged.

[Mr. Stott here, by means of enlarged plans, went through the main features of three kitchen lay-outs, two of which are illustrated in the accompanying diagrams.]

Contrary to the case a few years ago, the kitchen is now considered equally as important as any other portion of a modern catering establishment.

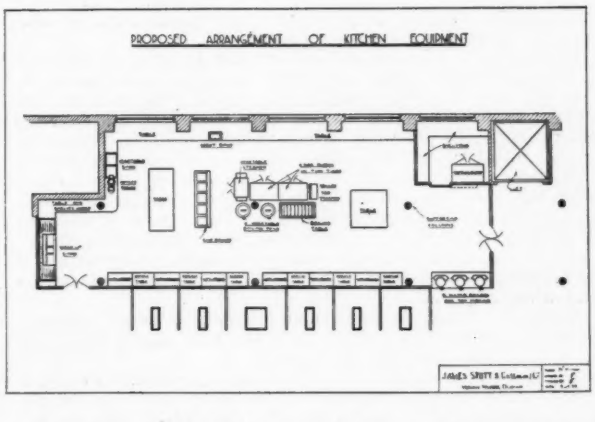
An interesting feature during recent years has been the growing popularity of enamel, chromium plate, and stainless steel. As against practically no large-scale enamelled apparatus and perhaps 10% of the copperwork in nickel ten years ago, we are to-day turning out approximately 70% of our heavy apparatus in enamelled finish and at least 70% of the copperwork in chromium plate, and using considerable quantities of stainless metal for hotplates, hotplate tops, dishes, urns and urn linings, interiors of steamers, steamer trays, complete water boilers, and sinkwork. There is no doubt that this factor has given the greatest encouragement to kitchen staffs to raise to a very high level the standard of general cleanliness in their kitchens. Unfortunately, stainless metal is comparatively expensive and also somewhat difficult to work.

A further feature during the past few years has been development of automatic control, and it may interest you to know that my Company were the pioneers of automatic control in large-scale equipment, and consider it essential to the satisfactory performance of all apparatus of the type manufactured by us.

Water Boiling and Coffee Making Equipment.

A water boiler or café set should be brazed in every possible joint and seam. It should be automatically controlled so that the gas is reduced when the water boils, and kept ready for immediate draw. I question whether there is a non-automatic expansion type boiler which will give an immediate draw of boiling water the very instant the draw-off tap is opened without carrying a by-pass of such size that steaming from the boiler is taking place when the water is not being drawn.

It should be capable of having a big reserve of water for an immediate draw to deal with the rush period. It should be self-feeding, of course, from the water main, and it is essential for café work that boiling water only should be delivered. By boiling water only I mean a temperature of not less than 210°-211° F. at the end of the spout.



I have heard of sink heaters being used for tea-making in catering establishments, and this, I think you will agree, is hardly a policy to be endorsed by gas undertakings. There can be no guarantee whatever of correct temperature for tea infusion, and while it will brew at lower temperatures than boiling point, the lower the temperature falls, the more tea is required to get the same actual strength of brew, until the point is reached, of course, when tea will not infuse at all. Furthermore, in hard water districts this type of heater is very soon useless if it has been used much for tea-making.

In the café sets the coffee infuser should be inside the urn, which improves the strength and flavour of the coffee. The urn lining should be easily removable, and it is advisable that the urns should be fitted with small burners. These not only serve to warm up cold milk quickly, but at the same time enable the water-boiling portion of the machine to be turned off and the coffee and milk urns to be used independently at such times as after dinner. The milk urn should be fitted with controlling device, so that temperature may be lowered if desired.

Should the establishment be of the type where tea-making in large quantities is required, then an instantaneous water boiler capable of giving an output up to 16 pints per minute continuously, having swivelling spout and working in conjunction with tea or coffee urns, is to be recommended.

Copper oxide deposit continually forms on every type of gas-heated water boiler. Unfortunately for the Industry, this cannot be obviated, but we have attempted to construct apparatus where this deposit may be easily removed, as being the next best thing. Our boilers are fitted with

three-legged base at least 2½ in. to 3 in. from counter level, providing sufficient room underneath to clean this out. This feature dispenses with the objectionable accumulation of this deposit, and we also consider the legs lend dignity to the design and life to the apparatus.

Correct gas pressure is very important, and experience has taught us that 20-tenths running pressure—with the boiler working full on—is best. Too much gas is as bad as too little.

Hotcupboards.

While a gas range is no doubt the heart of a kitchen, its value is considerably reduced if suitable provision for keeping the food hot and warming plates is not made by the use of hotcupboards.

The essential features of a hotcupboard should, I think, be substantial construction, sufficient heating medium to bring to a high temperature quickly, this temperature to be thermostatically controlled in the body. It should be possible to light the burners easily. The cupboard should be evenly heated, and at the same time the interior should be accessible for cleaning. The doors should be easy-running and the fitments on them well secured. The thermostat saves gas and makes for economy in crockery, as in a year's time many plates are cracked in the average restaurant through overheating in hotcupboards.

The bodies can be finished dull black, stoved black, various colours of vitreous enamel, or can be constructed throughout of stainless steel. The tops of the hotcupboards can be plain, heated or not as desired, or, on the other hand, can be fitted out as a service table, having a copper water well underneath to prevent food drying up. This serving table can be fitted with any number of carving dishes, round or square vegetable boxes, soup bowls, and so on.

Except in special circumstances it is usually a mistake to buy a standard illustrated hotcupboard because, taking into consideration the variations which can be introduced in these to-day, the manufacturers can easily quote for something far more suitable if exact particulars of the consumer's requirements are given.

Hotcupboards are made in varying lengths to fit odd spaces, varying depths for similar reasons, cast-iron tops, stainless steel tops, enamelled tops, tops with bain maries let in, or independently heated, tops with medium carving dishes, or large carving dishes, tinned copper vegetable boxes, stainless steel vegetable dishes, porcelain vegetable dishes, &c. The advisability of a circular or square vegetable box should be carefully considered, because after all, an 8-in. or 10-in. diameter box is hardly capable of holding potatoes or vegetables for perhaps 200 people, and in many cases the independent bain marie is better, into which the users' own various pots, pans, and dishes can be placed as and when required.

Attention should be paid to the fitment of some arrangement to prevent condensate from the bain marie dropping on to the plates in the cupboard.

If the hotcupboards are used for warming plates only, a rough guide is that a hundred 10-in. plates can be accommodated per 18 in. of length. If carved food is required to be kept on the plates as in a canteen, then various special styles of hotcupboards and warming cupboards can be supplied, and plate rings are usually used to enable the plates to be piled up.

Dishes and boxes should have rounded corners and bottoms. Shallow water wells under the serving tops are a disadvantage in that the water is too quickly evaporated and burning-out ensues. For use with larger hotcupboards we always recommend a ball cistern supply.

Recently there has been some demand for hotcupboards fitted on top with grillers and boiling burners, some of these being the full length of the hotcupboard, some at one end, and some sunk into the top.

Never more than two shelves should be fitted to an average-sized hotcupboard, otherwise the back of the bottom shelf is inaccessible. There can be an infinite variety of hotcupboards. Very often these are fitted with doors both sides so that waitresses may take out their own plates. Carving dish covers can be hinged to the top, fitted to pillars on the hotcupboard, or attached to ceiling roses, the latter being probably the most convenient.

The Food Steamer.

It is a well-known fact that many valuable vitamins are soluble in water, and that is to a great extent why steamed food contains far more food value than boiled.

A steamer should be arranged with heat-conserving jacket, so that the products of combustion passing round the steamer serve as an insulation. The steamer should always be fitted with a thermostatic gas control, as not only does this ensure economy in gas, but it often prevents steaming at the doors and most certainly ensures perfect cooking, in that once the cooking time is established, the food can always be cooked to the same degree every day.

The door should be of heavy pattern, easily opened and closed, and fitted with good, solid slides, a margin being allowed on the slides for the packing bedding in. An air relief valve is necessary on the top of the steamer to enable air shut in when the door is closed to be released, thus preventing a bank of air where there should be steam in the top of the steamer when cooking.

It is as well to realize the limitations of a steamer; for puddings, potatoes, and root vegetables they are admirable, but for green vegetables they cannot be recommended, as the greens lose their colour, it not being possible to add the small amount of soda generally used to retain their fresh appearance. When steaming fish it is advisable to use trays, which can be fitted as standard instead of baskets if so desired.

Vitreous enamelled finish is a big advantage on a steamer as it presents a very easy surface for cleaning. The steamer basket has been a debatable point for many years, and, taken all round, galvanized iron is probably the best.

Another steamer appliance takes the form of a sterilizer, in particular for dealing with milk bottles and farm utensils. Before the farmer can become certified to supply Grade A milk the dairy must be passed by an inspector, and a certificate cannot be issued until a sterilizer has been installed.

A good sterilizer should be quick-heating, give a fairly good supply of hot water for washing, have a jacket for economy, and sloping so that the condensate runs down the back instead of falling off on to the bottles. It should have a steam-tight door, air relief valve on the top, and an arrangement so that the steam can be released from the interior and the cabinet made into a dry-heated one for drying off the utensils. It should be possible to affix outside churn stool for churn sterilizing if desired.

Discussion.

Mr. T. G. Lewis (Leeds) mentioned that he had not noticed any electrically heated water boilers during the course of the visit. He enquired as to what were Mr. Stott's views concerning the hard water difficulty. Certain areas, among which were Warrington and the East Riding of Yorkshire, experienced considerable trouble in that respect, especially in regard to water boilers for tea making.

Mr. Stott replied that, like others, the Company did manufacture electrically-heated water boilers, but he was of the opinion that in the case of water boiling for tea making electricity was some way behind gas. The hard water problem was the most serious trouble with which any manufacturer of water boiling apparatus had to contend. The trouble was experienced not only in Warrington and the East Riding of Yorkshire but also along the East Coast, and, to a considerable extent, the South Coast. The most satisfactory way of dealing with hard water was for a maintenance contract to be entered into with the consumer, so that the boiler was regularly cleaned by trained men. In the London area, Messrs. Stott employed a number of fitters doing nothing else. In other areas, the gas undertaking usually undertook the service.

The problem of hard water brought into prominence the matter of the all-brazed boiler. It would be realized that any soldered joint had only to fill with hard water deposit and it would rapidly melt out. The only other alternative was a water softener, but this practically doubled the installation price of a water boiler and might affect the sale. Another point was that they depended upon the human element for regeneration.

Mr. F. Beaumont (Huddersfield) asked what was the effect of uncleaned-out stainless dishes in hotcupboard bain maries.

Mr. Stott said that if certain stainless steels were used there would be no actual attack on the metal. If the foodstuff got really bad the smell would probably make that effect known before any great harm was done, say, to the consumer of the food. All dishes should have rounded or dished bottoms, so that there would be no niches in which foodstuff could lodge.

Mr. H. Thackery (Elland) asked for information concerning the respective merits of the different linings for tea urns, and also whether milk bottles broke during the sterilizing process.

Mr. Stott observed that porcelain containers certainly "crazed" after a time, and broke out in a lot of hairlike lines; the glazing would gradually perish and the porcelain behind the glazing would tend to absorb the liquid, which would, of course, eventually give trouble. They were, however, very easy to change, and a replacement every few years at little cost would obviate this difficulty.

The Company had used a number of the heat-resisting glass linings which were extremely clean, the only trouble being that they were somewhat brittle and more expensive than porcelain to replace. The merits of pure nickel, or some form of stainless steel, as an urn lining should not be overlooked. He knew of such linings which had been installed twelve or fifteen years, and which were as sweet as the day they were put in. The secret of the success of all linings to urns of any sort was regular and thorough cleaning, both of the linings and the taps and fittings. In all his experience, he had not had brought to his attention any breakages of milk bottles in sterilizers,

although he would not say that such did not take place occasionally.

The PRESIDENT (Mr. J. W. Carlton, Shipley) asked why nickel or stainless metal lined urns were not popular.

Mr. STOTT replied that it was largely a matter of prejudice. Many people did not like having their coffee stored in a metal container, and often imagined they could taste something wrong. Possibly this was due to the fact that earthenware had been associated with the making of coffee for such a long time. On the other hand, one found tea made universally in tinned copper urns without any objection being raised, although the effect of the tannin on the tinning would unquestionably be severe. The whole point was that whether dealing with tea or coffee, if stored in metal containers, it was absolutely essential that the storage period should be as short as possible, as there would be no doubt that if stored for any length of time, some taste might be imparted to the liquid.

A question was raised as to the correct temperature for sterilizing milk bottles, to which Mr. Stott replied that, on the best authority, 10 minutes at 210° was considered to effect sufficient sterilization.

Mr. J. W. WOOD (Leeds) assumed that Messrs. Stott adopted the usual practice of chromium plating upon nickel. How long did Mr. Stott think the plating should last under ordinary commercial circumstances?

Mr. STOTT replied that the life depended entirely upon the thickness of the nickel coating applied to the surface to be plated; unless a good coating of nickel was deposited a long life could not be expected. All the firm's chromium plating was done upon a heavy deposit of pure nickel, and a good number of years' life could be expected. At the same time, one could not be dogmatic as to its performance under all conditions.

A further question was raised as to the suitability of hot-cupboards for keeping food in, to which Mr. Stott replied that the thermostatic control would be a great asset in that respect in that the thermostat could be set at a lower temperature; or failing this the hotcupboard could be fitted with a vapour bottom shelf, having a water well underneath and pipes to lead up to the other shelves and top.

Mr. F. R. B. FRENCH (Leeds) said that the preparation of foodstuffs was of very great importance to the Gas Industry, as such an enormous number of gas-consuming appliances were used in canteens, cafés, hotels, &c. He was certain that if the total gas consumption could be ascertained for a period of twelve months it would be a matter of astonishment. There were, undoubtedly, very many instances where the gas salesman could step in and increase the gas sales of his undertaking. A great point to be borne in mind was that the appliances recommended to prospective consumers must be absolutely suitable for the particular purpose required. Sometimes, for instance, people who desired to install a water heater would ask for a particular type which was totally inadequate for the number of people they desired to supply. In the laying-out of new canteen kitchens he had found it to be a very good idea to obtain an enlarged plan from the architect. He then took into consideration the number of people to be provided for, and the position of the entrances, exits, &c., to the dining hall. After selecting the various appliances it was a very good scheme to have cut-outs in scale with the kitchen plan, arranging them in various positions, and thus arriving at a scheme for the most practical kitchen for the particular purpose required.

Upon the motion of Mr. F. R. B. FRENCH, seconded by Mr. T. SMITH (Rochdale), a very hearty vote of thanks was accorded to Mr. Stott for his interesting communication.

Mr. STOTT, in conclusion, stated that he was aware of restaurants consuming 250,000 cu.ft. of gas per week regularly.

PRACTICAL SUGGESTIONS FOR
The Gas Industry in Australia

The Presidential Address of Mr. A. H. Smedley, General Manager of the Manly Gas Company, to the Australian Gas Institute.

With the exception of undertakings operating within the State of New South Wales, where the "gas unit" of 3,412 B.Th.U. is the basis of charge, the old standard of a rate, or rates, per 1,000 cu.ft. is still the statutory method of assessing the monthly or quarterly gas bill. It is quite true that several companies have decided to charge on the unit basis, but this has been done rather as an accessory to a sales policy than as a statutory obligation. When in England this question was discussed with a number of gas officials and the consensus of opinion seemed to be that it would be somewhat dangerous for undertakings in Great Britain to change over to the "gas unit" in view of the previous change to the "therm." They thought it would unsettle the minds of the consumers and thereby prejudice the value of quite a lot of the good work that had been done by the British Industry during the past decade. At the same time those to whom I spoke indicated that in their opinion the gas unit was a better basis of charging than the therm and, although this may not be regarded as a fully representative opinion, I think the Industry in Australia has made a deep impression on the minds of gas officials in other parts of the world in so far as the unit question is concerned, and is therefore to be congratulated.

Woman's Place in the Industry.

In introducing this important subject one may well ask a most pertinent question and it is this—"Has woman been given her rightful place in the programme of development of the Gas Industry in Australia?" It seems to me that up to the present we have been prepared to instruct and encourage the individual woman in the proper use of gas and appliances and have gone even a step farther by fostering goodwill relations through the medium of existing women's organizations, and while I am not in any sense deprecating this splendid work, I do not think it goes quite far enough. With the development of the "Home Service" idea, the Gas Industry has introduced an atmosphere of personal relationship hitherto unknown, but in the application of this idea the undertaking still seems to dominate the position, in that it lays down plans and formulates policies and *then* asks for active co-operation from those affected thereby. It is only within an undertaking that women share in the responsibilities of administration and their viewpoint becomes practically limited to the scope of the service to which they are attached. There is no opportunity afforded them of meeting and discussing the prospects and problems of the Industry from a local State or Commonwealth aspect, and I think this is wrong. A woman's point of view is almost invariably that of a consumer and the more information an undertaking can obtain in this connection, the better it will be for the Industry and the sounder will be the basis of tackling problems of development.

In Great Britain the position has been met by the formation of a Women's Gas Council, and in New South Wales there has been formed an Electrical Association for Women which has received a great amount of support from that industry. The aims and objects of the Association are:

(1) To collect and distribute information on the uses of electricity and to have regular lectures and demonstrations.
(2) To impart a knowledge of electricity and electrical appliances which will instil complete confidence in their safe handling.
(3) To arrange lectures in schools, colleges, and clubs and to broadcast in order to disseminate this knowledge as widely as possible.
(4) To have special courses of lectures and training for girls who wish to obtain employment in the electrical or radio world.
(5) To endeavour to reduce the present charges for electricity and electrical appliances by educating women to their advantages, and thus promoting increased current consumption.
(6) To encourage private enterprise and to stress the importance of buying only safe and reputable appliances.

This bold attempt on the part of our competitors to enlist the support of womenfolk in promulgating the principles of electric service, by allowing them an active participation in the actual work involved, cannot remain unchallenged, and I, therefore, emphasize the need for a similar organization within the Gas Industry of Australia, either as a branch of this Institute or as a separate entity. In the latter case it would be a body whose main plank in the policy platform was the gas supply in all its branches, rather than an association similar to many at present in existence, working with domestic ideals but with gas as a comparatively minor factor in its considerations.

Proposed National Gas Association of Australia.

The proposal, which has been under consideration since early in 1934, to form an association of gas undertakings and manufacturing interests which serve the Industry throughout the Commonwealth, is, to my mind, one worthy

of wholehearted support as it will overcome certain of the difficulties with which the Institute has had to contend where action in concert is required. That it should have taken so long to consummate such a worthy project is a matter for regret, and I was certainly hoping that it would have been possible to table at this Convention certain resolutions providing for the Australian Gas Institute being incorporated within the network of the activities of the National Association without, of course, losing in any sense its entity or usefulness as an Institute.

Although nothing definite can be done to-day along the lines just suggested, I would like to place before members a number of the advantages that would accrue should the suggestion be adopted at a later date. Of recent years the Institute has found it necessary to appeal to gas undertakings for financial support and this has been forthcoming. As the National Association would be supplied with the major portion of its funds by these same undertakings it could make an annual donation to the Institute, thus obviating the necessity for appeals. The National Association will be an organization provided with the machinery necessary to bring to finality those matters which are for the corporate well-being of the Industry, and as many of these matters may be the result of discussions and recommendations made at meetings of this Institute it is only logical that both bodies should be definitely allied the one with the other and that there should be allotted out of a common fund such amounts as are necessary to the requirements of both. There is no doubt in my mind that the proposed National Association will, when formed, be recognized as the authority on all gas matters throughout Australia, and it will therefore be most advantageous for this Institute to become an integral part of the Association as in such case the Institute would have a higher status than if it remained as a more or less detached force. Then again it may so happen that, for purely domestic reasons, an undertaking may be unable to join the National Association, but if officers of that undertaking were members of the Australian Gas Institute, and that Institute in turn were a member of the Association, then those officers would be afforded the opportunity of making their contribution to the advancement of the Industry through the work of the Association even though the undertakings they represented were not actual members of the National body.

I am confident that every member will agree with me when I say that, during the past two years there has been a most marked advancement made in the Gas Industry in Australia. With the introduction of modern technique in showroom displays, coupled with intensive propaganda to an extent almost undreamed of before, there is being created, slowly but surely, a distinctly favourable attitude to gas, based on a better understanding of its real value as a domestic and industrial heat service. This is the result of individual effort by respective undertakings without any preconceived policy of co-ordinated activity, and one may therefore forecast even greater results through a national organization.

Residuals.

In his Presidential Address in 1927, Mr. Andrew Wilson strongly urged the formation of a Commonwealth Road Tar Association. Unfortunately this recommendation met the same fate as did many others in that nothing at all was done to carry it out. If the need existed in 1927, and there is no doubt that it did, it is still with us to-day and in a more accentuated form. But I would go further and say that we should have a Federal organization with active branches in each State, to advise on and control matters affecting all residuals, and particularly the coke market. There are definite economic factors which intrude themselves into the consideration of this important matter, and while we have those who press strongly for the complete gasification of coal there are others who pin their faith to the production of graded residuals because of a favourable market open to them. There can therefore be no common rule for adoption, but let me sound a note of warning to the effect that a change is slowly, but surely, taking place in the residuals position overseas due to the introduction of low-temperature carbonization methods and the production of "Coalite" and other similar smokeless fuels. The type of plant necessary for this production is not *as yet* in use in Australia, but we would be very foolish indeed to close our eyes to future possibilities having regard to experience in other parts of the world. Then there is the aspect of overlapping trading in residuals to be considered, and this constitutes a real difficulty with a diminishing market. In New South Wales the manufacture of water gas has relieved the coke position for quite a number of years, but there are indications that the economic limit is being reached by some of the large companies in so far as this grade of gas is concerned, and it is therefore imperative that the outlook be reviewed. The logical means of doing this is through an association which could control marketing on a quota basis, leaving it to the individual undertaking to determine its future policy of gas manufacture in the light of prospective business in residuals. Perhaps the solution of the whole matter lies in the proposed National Gas Association of Australia which includes in its Memorandum of Association an object clause which reads: "To promote closer relations and co-operation in all branches of the Gas Industry and between the various producers of gas and its by-products in Australia and elsewhere."

This all-embracing clause fully provides the means of achieving the objective which I have set forth and at this I leave it.

On the question of tar, the latest figures, according to a statement recently published, show that approximately 125,000 tons are recovered annually by Australian gas undertakings. Of this quantity about 20% only is being used on roads, while the balance of, say, 100,000 tons, is consumed as fuel at gas-works and elsewhere. It is interesting to realize that if the demand for road binders were to absorb the whole of the tar output, the production of Australian coal could be increased by about 150,000 tons each year, thus assisting in the rehabilitation of this important Industry. The position in regard to the manufacture of tar for road purposes is somewhat complex in that all undertakings are not making the same grade, and this only strengthens my argument for a central body to control the residuals position with a view to better marketing. The competition from imported binders is very keen indeed, and yet one cannot help feeling that we as a whole are not without blame in regard to our attitude to such competition. If we are to meet the position successfully we must standardize on our product, otherwise how can an industry hope for protective measures when that industry has apparently not made up its own mind with respect to that which it has to offer to the authorities who control road construction.

Electrolysis.

We find that mains and service pipes, which under ordinary conditions would last for many years, require renewing at periods much below their normal life, due entirely to pitting caused by electrolytic action. This leakage of current is definitely impairing the efficiency of the gas service pipes and mains, and yet what is the Industry doing about it? Committees meet and discuss the problem and lay down plans and formulate policies to overcome the trouble, but in the meantime who is bearing the cost? I do not know of any other industry that would treat this matter with such apparent complacency. Can one imagine a case where any leakage of gas caused corrosion or erosion to the property of another public utility that there would not be an immediate assessment of the damage so caused and the gas undertaking called upon to make good, and that without delay? Of course one is faced with the fact that where two or more electrical services are contiguous to gas pipes, there is always the difficulty of ascertaining from which service comes the leakage of current, but this can be overcome, and it appears to me as only a reasonable corollary to the position that where such leakages are found to exist, the onus of proof as to the origin of the trouble should rest not with the gas undertaking, but rather with the electrical authorities concerned, who should be compelled to adopt remedial measures without any cost to the affected undertaking. The Electrolysis Committees as now constituted are definitely limited as to the extent of their powers, in that they can only make recommendations and agree to working arrangements as between the various bodies, but they have no statutory authority. This means that they can only look after the future by suggesting preventive measures, and the question of the assessment of damages is still left in abeyance, as no one public utility is prepared to accept responsibility in this regard. In the meantime the Gas Industry is suffering a grave injustice in that it is called upon to meet repair and replacement costs due to circumstances beyond its control, but not beyond the control of those responsible for electric services provided they expended the money necessary to ensure the proper flow and return of the current, an expenditure they should be compelled by law to meet.

Bottled Gas.

A development of comparatively recent date, and one which has materially affected the activities of the Industry in other parts of the world, is the sale of a bottled gas known as butane. So far America and Continental countries, particularly the latter, have led the way in the sale of this product, which has been marketed under the trade names of "Calor Gas," "Rock Gas," &c., and we find that in France alone there are over 380,000 consumers using bottled gas. The British Technical Press have re-

cently been giving prominence to the possibilities of butane and a selling organization is now operating in the Motherland, under the title of "The Calor Gas (Distributing) Co., Ltd." That there is apparently an immense future for the use of this type of gas cannot be disregarded by our Industry, and I would go further and say that we should fully explore its possibilities, especially having regard to its adaptability in those areas where the population is so scattered that extensions of mains are not warranted in the light of anticipated revenue.

Of course, the practicability or otherwise of distributing bottled gas is allied with the question of cost, and very little information on this is, as yet, available to us in Australia. At the time of writing this address the only figures to hand indicate that the cost of the gas in containers c.i.f. Sydney will approximate 2s. 9d. per therm, and this, of course, makes it prohibitive.

Butane, as we all know, is mainly a constituent of natural gas, and the outlook is, therefore, not without hope in the light of recent developments in Sydney, where natural gas has been discovered in the adjacent suburb of Balmain. This gas has been duly analyzed and has been found to contain over 95% methane, with a calorific value of approximately 1,000 B.Th.U. per cu.ft. The pressure at the head of the bore has remained fairly constant, varying between 15 and 18 lb. per sq.in., but owing to the absence of the plant necessary to withstand very heavy pressures, boring operations have been discontinued and will not be resumed until proper safety apparatus is installed. It is therefore impossible to gauge, with any degree of accuracy, the quantity of gas that is available, although the indications are that the supply is very considerable, a contention which is supported by a recent report published on American bores, wherein it was pointed out that the most prolific natural gas wells were those sunk in coal measures, a condition appertaining to the Balmain source of supply. Although there is, as yet, no evidence of the presence of butane in the Balmain gas; there is quite the possibility that when such gas is released at greater pressure by the continuance of boring operations, butane will be found as one of the constituents.

Customer Credit.

Statistics reveal that, with one or two exceptions, the principal gas undertakings of Australia derive between 75% and 85% of their gas sales revenue from alleged credit customers. I use the word "alleged" advisedly, because in actual fact only partial credit is allowed in that deposits are required in most cases where occupiers of premises are not the owners of the property. It is the demand for these deposits that calls for most serious reflection, as I believe it constitutes a danger point in our negotiations with consumers by creating unwarranted prejudice in the minds of those called upon to pay. What an undertaking really says to an applicant for the gas supply through an ordinary meter is this—"While we are glad to get your business, we do not trust you, and so we ask you for a deposit." Of course, we do not put it as blatantly as this, but the demand in many instances creates this impression, and the reaction is detrimental to the establishment and maintenance of the spirit of goodwill which we seek to foster by service in other directions.

Water Heating.

During recent years a bold attempt has been made by all progressive gas undertakings to capture the water heating load, and with phenomenally successful results, particularly with regard to the installation of storage systems. There has, however, lately developed in Sydney a demand for a flat rate charge for this type of heater, and both builders and architects are pressing for quotations along this line. It is a problem which the Industry has to face quite definitely, and although it is impossible to obtain guarantees of hot water consumption, I think we will have to be prepared to run a small risk on individual installations, believing that, on the average, the monthly flat rate will provide a satisfactory return to the undertaking. Of course, gas for hot water is generally sold at a rate considerably below the normal domestic price—at Manly it is 40% below—and due regard must therefore be paid in developing this load to the economic factor of manufacturing and distributing plant requirements, otherwise an undertaking may find itself in the position of having to erect additional plant to meet an output which does not bear its full proportion of all charges. This possibility, while being somewhat remote, must nevertheless be taken into account when flat rates are being considered. As a temporary expedient to meet the new demand my Company has agreed to supply each flat with ten shillings' worth of gas per month at the starting rate of 40% off the normal selling price, and any more gas used by the storage system will be supplied at a further discount of 25%. The actual flat rate has not yet been introduced.

THE CORROSION OF
Underground Gas Mains and Services

by
T. W. HUGHES
(of the Australian Gas Light Company).

From a Paper before the 1935 Convention of the Australian Gas Institute, in which the Author discussed this important problem which confronts the Gas Industry to-day.

Soil conditions are affected by so many variable factors, and in view of the findings of the U.S. Bureau of Standards it is considered that the chemical nature of the soil is one of the least important characteristics governing its corrosiveness. Chemical analysis alone as a guide to the corrosiveness of soil would, therefore, be not only futile but misleading.

Corrosion, being an ionic process, depends upon the liberation of hydrogen ions to attack a metal and therefore it cannot proceed in the absence of water. Hence, the water content of a soil is of first-rate importance in determining whether the soil is corrosive.

Furthermore, since the corrosion of metals is generally recognized to be due to differences in potential in the exposed metal surface, and therefore to be electrolytic in character, it follows that a condition giving rise to potential differences will tend to promote corrosion. E. R. Shepard[1] stated that the chief source of galvanic potentials is the unequal distribution of oxygen on the surface of the buried pipe, the areas deficient in oxygen being anodic to the areas having a greater oxygen concentration.

Shepard also pointed out that the oxygen supply varied with the moisture content, grain-size, topography and depth of the soil, so that in a length of pipe the portion nearest to the surface would be less vulnerable to corrosion than the portion lying in a water-logged hole, due solely to the lower concentration of oxygen on the surface of the pipe lying in water.

Thus soil corrosion may be regarded as a form of electrolysis, the term "Auto-electrolysis" frequently being used in this regard as distinct from "stray-current" electrolysis, which is discussed more fully later in the Paper.

Physical Nature and Condition of Soil.

The physical nature, as affecting the ability of the soil to retain moisture and to cause unequal distribution of oxygen on the metal, is a far more important consideration than its chemical composition.

Clays and shales being fine-grained in texture readily retain water, while soils of a sandy nature being relatively coarse-grained permit any water falling on them to drain away.

Experience of the Australian Gas Light Company's district bears out the contention that the greatest amount of corrosion is suffered by mains and services buried in clay and shale soils, which predominate in the area served by the Company. Relatively little corrosion occurs in the Eastern suburbs where sandy soil mostly occurs.

It has also been the Company's experience that the sections of service pipes passing under unformed gutters at the edges of a roadway suffer the greatest degree of corrosion, as do the sections of mains in low-lying localities.

[1] Industrial and Engineering Chemistry, 26: 723-32. July, 1934.

This supports Shepard's contentions, as previously discussed.

One could dilate at length upon the various methods which have been suggested from time to time for determining the relative corrosiveness of soils, but the time available does not permit of more than the above brief mention.

Properties Affecting Corrodibility of Pipes.

The following ferrous alloys are in general use for the construction of mains and services:

(*a*) Pure iron
(*b*) Wrought iron } services.
(*c*) Mild steel
(*d*) Cast iron:
Centrifugally spun and sand cast } mains.

Each of these metals consist principally of iron with or without varying proportions of carbon; wrought iron containing slag inclusions in addition.

Contrary to the usually accepted belief that pure iron and wrought iron are superior to mild steel for small mains and services, it has been found that, as far as the Australian Gas Light Company's experience shows, all three are equally prone to soil corrosion.

The underground corrosion of ferrous alloys is characterized by pitting, which is indicative of the occurrence of local galvanic cells set up within the metal itself caused by mechanical strain or heterogeneity of composition. Rust (iron oxide) which is cathodic to iron also causes the metallic iron with which it is in contact to corrode under favourable conditions. Black oxide of iron, which is formed by the oxidation of the metal during manufacture, if continuous over the surface of the pipe affords a definite protection to the underlying metal. If on the other hand the coating is ruptured, corrosion of the exposed iron proceeds rapidly due to the fact that the metal is anodic to the mill scale.

Cast iron, apart from undergoing graphitization, also develops pits, and the spun iron is somewhat more prone to pitting than is sand cast iron, the latter tending to corrode more uniformly.

Electrolysis, or the electrolytic corrosion of buried mains and services, is caused by stray currents leaking from electric traction systems. Generally electrolysis is the process whereby changes are brought about in an electrolyte by the passage of an electric current. The electrolyte is the medium through which the current flows from the positive anode to the negative cathode, the whole system forming an electrolytic cell. When an electric current passes through such a cell the metal forming the electrode, by which the current passes into the electrolyte, is corroded, and the process is known as anodic corrosion. The relative amounts of the various metals which are corroded away by unit quantity of electricity are proportional to the respective electro-chemical equivalents of the metals, and the ratio of the weight actually corroded to that theoretically corroded is termed the " coefficient of corrosion."

It is not the purpose of this Paper, however, to enter upon a lengthy discussion of the theory of electrolysis, and the above outline will serve to explain only its fundamental principles.

Electrolysis may arise from:

(*a*) Potential differences in the metal of pipes, due to strain or heterogeneity of composition—so-called auto-electrolysis as mentioned earlier in this Paper;
(*b*) Galvanic currents set up in the pipe by its passage through soils of different composition;
(*c*) Unequal distribution of oxygen along the pipe surface; or
(*d*) Stray traction currents.

In the discussion which follows, the term electrolysis will be used solely with reference to corrosion caused by stray currents resulting from potential differences external to the soil and the metal buried in it.

While stray currents may be due to a number of causes, such as telephone and signalling currents, D.C. lighting and power systems and electric traction systems, the last-named is the most important and for that reason will be the only one considered.

It will be realized that soil, containing salts in solution, can be regarded as an electrolyte and pipes buried in it complete the electrolytic cell by forming the electrodes. An externally generated current passing through the cell will cause the section of the pipe forming the anode to corrode.

The electrolysis conditions of mains and services laid in areas affected by traction systems, are governed by the soil potentials through which the pipes pass, current being collected in soil-positive areas and given up again to soil-negative areas.

Extensions and rearrangements of traction systems or variations in their operating conditions may at any time transform safe areas into danger areas and *vice versa*. Hence, in order to protect mains and services, alterations in traction systems must always be carefully studied and watched in the areas served by gas undertakings.

Many factors have a bearing on the electrolytic corrosion of buried pipes as follows:

(*a*) The electrical conductivity of the pipe.
(*b*) The types of joints employed.
(*c*) The metal constituting the pipe.
(*d*) The use of protective coatings.
(*e*) The relative position of pipe and traction rails.
(*f*) The existence of other underground metallic structures.

These will now be briefly dealt with seriatim.

(*a*) **The Electrical Conductivity of the Pipe** will naturally affect the quantity of current carried. The greater the conductivity the greater the flow of current and hence the greater the amount of current leaving the pipe, which results in excessive corrosion. This factor is also linked with the method of jointing mains.

(*b*) **The Types of Joints Employed.**—Some joints have a higher electrical resistance than others and hence the overall resistance of a pipe is the sum of the resistance of the metal and the joints. If the joints used throughout the length of pipe are of uniform resistance, the potential curves of the pipes will be smooth. If, however, the majority of the joints are of uniform low resistance, while a few are of relatively high resistance, current will tend to leave the pipe in the immediate vicinity of the latter giving rise to corrosion at those points.

(*c*) **The Metal Constituting the Pipe.**—The selection of the metal used in fabricating the pipe is of the utmost importance since the weight of metal corroded by a given quantity of leakage current depends upon the electro-chemical equivalent of the metal. For example one ampere flowing for one year will theoretically corrode 20 lb. of iron, 23-46 lb. of copper, and 73 lb. of lead. These theoretical quantities vary in practice, however, and it has been found by a series of laboratory experiments conducted by the Australian Gas Light Company that spun and sand cast irons exhibited somewhat different characteristics under identical electrical conditions, due probably to their different chemical compositions and crystalline structures.

(*d*) **The Use of Protective Coatings** is intended to insulate the pipe from the surrounding soil. In order to be completely effective, the coating should cover not only the main, but also valves, syphon pots, and services, an ideal difficult to attain in practice. The coating, moreover, must be good throughout its entire length and free from cracks otherwise intense local corrosion may occur at breaks in the coating and extend beneath the coating over extensive areas. Nevertheless the use of coatings is of importance in the design of remedial measures even if the coating is somewhat imperfect.

(*e*) **The Relative Positions of Pipes and Traction Rails** obviously affect the amount of current picked up and discharged by the former, the closer the pipe to the rail the greater the density of current flow to or from the pipe. Hence, pipes should be laid as far as practicable from rails and where it is necessary to pass the pipes beneath rails they should be buried as deeply as possible. In fact, in some countries a minimum depth is frequently specified, below which the pipe must be heavily insulated.

(*f*) **The Existence of Other Underground Metallic Structures** must be taken cognizance of when considering the corrosion of gas pipes due to electrolysis. Thus water mains are frequently connected to gas mains via bath heaters, and while the gas mains may not otherwise carry electrical currents, these may be transmitted to the gas mains from water mains which have received currents from some traction system. Cases have also been known in which telephone cables have been affected by crossing over water mains, the electrolysis being so severe as to cause metallic lead to be deposited on the water mains.

In another case the Australian Gas Light Company's service pipe was connected via a bath heater to a water service which was carrying leakage current from a railway sub-station at such a high voltage as to ignite the gas when the service pipe was cut.

The Prevention or Amelioration of Underground Corrosion.

Having discussed the causes of the underground corrosion of mains and services, it now remains to deal with the methods by which this corrosion may be combated and the economic lives of the structures extended.

The problem of pure soil corrosion is closely interwoven with that of electrolysis since soil corrosion is a form of electrolysis, as previously mentioned, and some methods

of mitigating the corrosion are, therefore, common to both. Nevertheless, for the sake of convenience of discussion, the methods of preventing the corrosion due to these two causes have been accorded separate treatment.

Several methods of lessening the severity of soil corrosion, or otherwise prolonging the economic lives of buried pipes, may be suggested and may be broadly grouped into:

(1) The use of thicker walled black iron pipe.
(2) The use of metals, alloys, or non-metallic materials having a greater corrosion-resistance than black iron.
(3) The application of protective coatings to the ordinary pipe.
(4) The treatment of the soil surrounding the pipe.

The suitability of each of these methods will depend upon:

(*a*) Whether it can be used without recourse to road openings; or
(*b*) Whether road openings are necessary for its application, and it is proposed to deal with them under the foregoing broad headings.

It has been the practice overseas for quite some time to thread service pipes beneath roadways, and the high cost of road reinstatements in Sydney has in recent years forced the Australian Gas Light Company to adopt this method of service laying wherever practicable. In the case of renovated services, the new pipe is inserted in the tunnel remaining after the withdrawal of the old pipe. New pipes may be threaded under roadways by first of all boring a passage by means of a suitable machine. A machine has been in use by the Australian Gas Light Company for some months now, and it is estimated that an average saving of approximately 25% in the cost of road restorations occurs from the use of this and similar machines now on order.

It is obvious that any substitute for ordinary black iron pipe, or method designed to mitigate soil corrosion, must be limited to the use of thicker-walled iron pipe, metals, alloys, or non-metallic materials mechanically strong enough to stand pushing through the soil and to protective coatings, which would not be abraded or otherwise damaged by such treatment.

As the result of an extensive investigation it was found by the Australian Gas Light Company that the most suitable service pipes to be used where road openings could not be made were:

(1) Thick walled black iron pipe (so-called "steam pipe").
(2) Copper pipe of 14 gauge.
(3) Lead pipe of 9 lb. per linear yard.

A brief explanation of the reasons for the above choice may here be deemed necessary.

Protective coatings must be limited to those of a metallic nature, since on threading the pipe through the ground thin coatings such as paints would be easily chipped and abraded and thick coatings would obviously be impracticable. Metallic coatings such as copper, lead, tin, and zinc, and processes such as sherardizing and coslettizing have all proved failures. Some claims may be made for the efficacy of galvanized or zinc-coatings, but numerous galvanized water pipes laid side by side with black iron gas pipes on examination were found to have failed as badly as the gas pipes.

Ferrous alloys containing high percentages of copper, chromium, nickel, or silicon have not proved successfully resistant to soil corrosion and their comparatively high cost militates against their use. Non-ferrous alloys such as aluminium, zinc, nickel, and monel metal may be eliminated on the score of undesirable chemical and physical qualities or prohibitive initial cost.

Of the non-metallic materials available for pipes, asbestos cement probably shows the greatest promise, but its desirability for the construction of gas pipes is not yet established.

Let us, therefore, return to a consideration of the most suitable materials for the construction of gas pipes to be threaded under roadways:

(1) Thick-walled Black Iron Pipe will obviously prolong the life of a service since such a pipe will necessarily take longer to corrode through than one having a thinner wall, and an iron pipe having a wall thickness of 0·25 in. will last approximately twice as long as one having a thickness of 0·125 in. The Australian Gas Light Company is now using 1 in. diameter steam pipe having a thickness of 0·16 in. in lieu of the thinner-walled black iron pipe formerly employed.

(2) Copper Pipe, as the result of careful investigation, is considered to be eminently suitable for service pipe construction. It is relatively costly, but not prohibitively so, and has been used by the Metropolitan Water, Sewerage, and Drainage Board for several years. Copper is highly resistant to acidic soil corrosion, more so than brass and other copper-rich alloys, and less expensive, although there are cases on record that copper pipes are not as resistant as steel pipes in highly alkaline soils. Pipes constructed of 14 S.W.G. copper are estimated to have a life 6·4 times that of black iron pipe having a wall thickness of $\frac{1}{8}$ in. There are no practical difficulties in jointing copper pipe, and there is no appreciable risk of damage to cast iron or steel mains to which it may be connected due to galvanic electrolysis. Objections have been raised in the past to the use of copper tubing for the transmission of gas on the grounds that explosive compounds may be thereby formed. Exhaustive enquiries, however, have shown that there is no danger on the above account, and, further, it has been shown that town gas, as distributed by the Australian Gas Light Company at any rate, has no appreciable effect on copper piping.

(3) Lead Pipes are even more resistant than copper pipes to acidic soil corrosion. The loss in weight per unit area of lead is only about one-tenth of that of ferrous material under similar conditions, and lead pipe weighing 9 lb. per linear yard is estimated to have a life 15 times that of pipe manufactured of $\frac{1}{8}$ in. thick black iron. It has been generally found that commercially pure lead, known as chemical lead, is more resistant to soil corrosion than alloyed lead containing such metals as zinc, antimony, and bismuth.

An examination of numerous lead meter connections revealed that the lead was not affected by the corrosive constituents of the Australian Gas Light Company's town gas, so that trouble from the internal corrosion of lead service pipe should not be expected.

Lead pipe can be successfully drawn under roadways by means of a simple gripping device. Its tendency to sag, which would allow condensate to collect in the sagged portions does not form a serious obstacle to its use, since it is extremely unlikely that the undisturbed ground would subside.

In addition to the use of the materials for pipe construction just dealt with, in the case now under consideration, either the soil may be treated to render it less corrosive or suitable protective coatings may be applied to the pipe.

Treatment of the Soil may take the form of draining the trench, back filling with broken stone or sand with or without the addition of hydrated lime and supporting the pipe therein, or the treatment of the soil with oil with the object of waterproofing it. Such methods, however, are mere palliatives and are of doubtful efficacy since oxygen-saturated water is the main corrosive agent in soil corrosion.

Protective Coatings.

Cement-mortar coatings have been successfully employed for many years in the U.S.A., and black-iron pipes so treated and buried in Sydney soil were found on examination to be in perfect condition after eighteen months, whereas unprotected black iron pipes laid alongside them were badly pitted.

There are no practical difficulties in the use of cement coatings either precoated or applied *in situ*, and the Australian Gas Light Company is now using, in many cases, the latter method of protecting small diameter mains. The cross-section of the concrete coating is square and the minimum thickness used on 1½ in. diameter mains is 1 in.

While the initial cost of the concrete-coated pipe is about 33% greater than that of unprotected pipe when laid, an ultimate saving is effected by the use of pipe so protected when the extended life of the pipe is taken into account. Lime mortars, while affording good protection to embedded iron, lack sufficient mechanical strength to find practical application.

It must be emphasized that, irrespective of the type of protective coating employed, it is essential that the pipe surface be entirely freed from rust and scale by some means such as scratch brushing or sand blasting before the coating is applied.

The Mitigation of Electrolytic Corrosion.

The methods available for the lessening of the electrolytic corrosion of buried mains and services may be divided into two principal groups:

(*a*) Electrical methods;
(*b*) Methods utilizing protective coatings;

and will, therefore, be discussed under their respective headings.

The Electrical Methods of combating electrolytic damage usually employed are as follows:

(1) The prevention of leakage of current from the rails.
(2) The use of insulating joints.
(3) Electrical drainage.
(4) Booster drainage.
(5) Shielding.
(6) Cathodic protection.

Each of these will be briefly described in the above order.

(1) The Prevention of Leakage of Current from the Rails lies in the province of the traction authority and may be affected by the complete insulation of the rails from the surrounding earth. Negative feeders, efficient rail bonds, good ballast, and effectual drainage of water from the track also materially assist in reducing the amount of leakage current.

(2) The Use of Insulating Joints as a means of reducing the electrical conductivity of gas mains has been dealt with previously.

(3) Electrical Drainage of a main comprises the attachment of a suitably designed metallic bond between the main and the rail at points where the main is discharging current to the rail, and is designed in such a manner that the potential of the main is reduced to a value below that of the surrounding soil. This method is particularly applicable to coated steel mains having screwed or welded joints. Such mains provide a high electrical conductivity which permits of longer sections of the main being lowered to a safe potential, while the coating provides a high resistance between main and soil thus reducing the amount of leakage current to be handled by the bond or alternatively permitting a greater length of main to be protected. Cast-iron mains with high resistance joints cannot be effectively protected by this means.

The method is not nearly so effective for bare mains, the protection extending over only relatively short lengths of such mains. Similarly its value decreases when used on a coated main having services laid bare in the ground.

The reason for this is that a much greater leakage current flows on the main when its potential is lowered by the connection of a drainage bond. This increased current causes a much greater drop in potential along the main and thus only comparatively short lengths of it can be lowered in potential below that of the surrounding soil.

(4) Booster Drainage, a modification of the previous method, is employed in cases where the rails are positive in potential to the main, and drainage current is forced through the bond usually by means of rectifier supplied with A.C. current.

This method suffers the same limitations as the ordinary drainage method.

(5) Shielding consists of bonding the main to a metallic plate from which the stray current is discharged instead of from the main. This method finds only a limited application.

(6) Cathodic Protection is virtually a combination of booster drainage and shielding in which the main is connected to an earth plate consisting of, say, an old main buried at some distance from the main to be protected and the current is forced by some form of electrical booster to flow from the main to the earth plate there to be discharged to the soil. The same limitations apply to this as to the foregoing methods.

If is frequently impossible to apply protection to many sections of an existing reticulation, save at a prohibitive cost. Nevertheless, as a result of electrolysis and soil surveys, new mains might be laid in such a manner that protective measures might be immediately applicable and considerably longer lives for such mains would be ensured.

Several drainage bonds have been installed on the Australian Gas Light Company's mains which have successfully reduced the potential of long sections of the mains below that of the surrounding ground.

A similar bond has also been connected to a main, which was rapidly undergoing disintegration, for the Manly Gas Company.

The Methods Using Protective Pipe Coatings for protection from electrolysis were extensively investigated by the U.S. Bureau of Standards and the following conclusions published[1]:

(1) Pipe paints, dips, and wrappings (bituminous and otherwise) were invariably ineffective in positive areas near power houses. Used in negative areas, however, they form at least temporary protection in minimizing the current picked up by the pipe, thus reducing the damage in the positive areas.

(2) The use of protective coatings in negative areas, while reducing the amount of current collected by the main, must be regarded as only a secondary form of protection to some electrical method.

From the results of a further series of tests by the U.S. Bureau of Standards[2] on the effect of electrical currents on Portland Cement concrete-coated iron pipes it is evident that such a coating would afford ample protection against stray currents having voltages normally to be expected in practice.

It is obvious that the ideal coating must possess a comparatively high electrical resistance in addition to the desirable properties previously enumerated.

Bitumen is well known as an electrical insulator and from the foregoing facts cement-mortar must also be regarded as possessing sufficient electrical resistance for use as a protection against electrolysis.

Obviously, therefore, thick bituminous coatings and cement-mortar coatings are effective in affording protection against soil corrosion and, in a less degree, against electrolysis.

Economics of Extending the Lives of Mains and Services.

No Paper on the subject of soil corrosion would be complete without dealing with the economic aspect of extending the lives of mains and services.

Sand cast iron corrodes less rapidly than steel mains, probably due to the chemical composition and crystalline structure of the metal as affording resistance to purely soil corrosion and due to the high resistance of the metal and lead joints usually employed, which prevent the flow of stray currents in sufficient quantities to cause appreciable damage. In addition, on account of their greater wall thickness, cast iron mains have a longer useful life than steel mains under the same conditions.

The problem is not serious, therefore, in the case of mains as in the case of steel services, since sand cast iron mains may be conveniently used, hence the economic aspect will not be dealt with.

The economics of methods of extending the lives of services vary somewhat with the systems of accounting employed by various undertakings. Taking a simple case, however, in which the cost of the services is charged to capital and the rate of depreciation is charged on what is commonly termed a " straight-line basis " one obtains the results shown in Table 1.

TABLE 1.—*Showing a Comparison between the Annual Cost of Service Pipes Constructed of Various Materials.*

Material.	Total Capital Cost of the Service when Laid in Open Trenches. (Pence per Linear Foot).	Life. (Years).	Annual Cost per Annum (Interest on Capital at 6% and Depreciation Charged on a " Straight Line " Basis). (Pence per Linear Foot).	Annual Cost Relative to Black Iron = 1.
Black iron pipe (wall thickness ⅛ in.) . .	37	10	5·92	1·0
Copper pipe (14 gauge)	51	65	3·86	0·65
Concrete coated black iron	40	30	3·73	0·63

The lives of the various service pipes in Table 1 were based on the experience of public utilities overseas, while the annual cost was computed from the following formula:

Annual cost $= x\,(r + y)$ pence per linear foot.
Where x = The capital cost of the service (pence per linear foot).
r = the percentage rate of interest paid on capital.
y = the life of the service (years).

The economics of the protection of mains and services from electrolytic damage may be treated in a somewhat similar manner. In this case the cost of main and service renewals must be weighed against the cost of installing and maintaining protective measures such as booster drains, which require a supply of A.C. current, and the cost of pipe coatings.

[1] Technologic Paper No. 15.

[2] Technologic Paper No. 18.

Technical Data on Fuel*

Reviewed by H. Hollings, M.Sc.

In the conduct of technical investigations of all kinds a short cut may often be found to the objective if the results of earlier and allied investigations are first co-ordinated upon a uniform basis and submitted to a critical review. This often involves some simple mathematical treatment of the results. Indeed, with increasing specialization, a proper mathematical consideration of accumulated facts is ever becoming a more important phase of any industrial research. Thus the possession of a reliable set of working data is a matter of prime importance. The Editor of "Technical Data on Fuel" has supplied, in a compact and eminently practical form, just what is required by many technical workers engaged in the fuel industries.

The earlier editions are already well known and have earned a wide reputation. The fourth edition has been enlarged in its scope, but thanks to excellent production it has not increased in bulk. In carrying out the revision of data the Editor has had the advice of a Committee appointed by the British National Committee of the World Power Conference and representative of the gas, oil, electrical, steel, and chemical industries as well as of important research organizations. Thus the data which have been selected may be used with confidence and with a knowledge that they will not be questioned without good reason being given by other workers.

Most chemists and engineers on gas-works probably have access already to one of the earlier editions. They should, however, secure a copy of the new edition. Much new and hitherto unpublished information is included. Particular attention may be called to the inclusion for the first time of the so-called theoretical values for the specific heats of gases. These are calculated from the spectroscopic characteristics of the gases and are believed to be the most accurate available, particularly in the higher temperature ranges. The data are given in the form of true specific heats at stated temperatures and also in the more useful form of mean values up to stated temperatures. It is important that those who are engaged in the preparation of thermal balances relative to the carbonization of coal or gasification of coke, or, indeed, any process of fuel production or combustion, should be familiar with them. Other noteworthy additions include the properties of saturated gas in the units commonly employed in the Gas Industry, standard definitions of calorific values, and calculations of maximum flame temperatures.

The clearly worded explanatory notes which are included should facilitate the proper application of scientific data to practical problems. The following headings of such notes may be quoted as examples to indicate the scope: Pyrometers, fluid flow in pipes, correction factors for meters, chimneys, humidity, conductivity, insulating materials, heat transfer, the properties of alloys, ignition temperatures, and pulverized fuel.

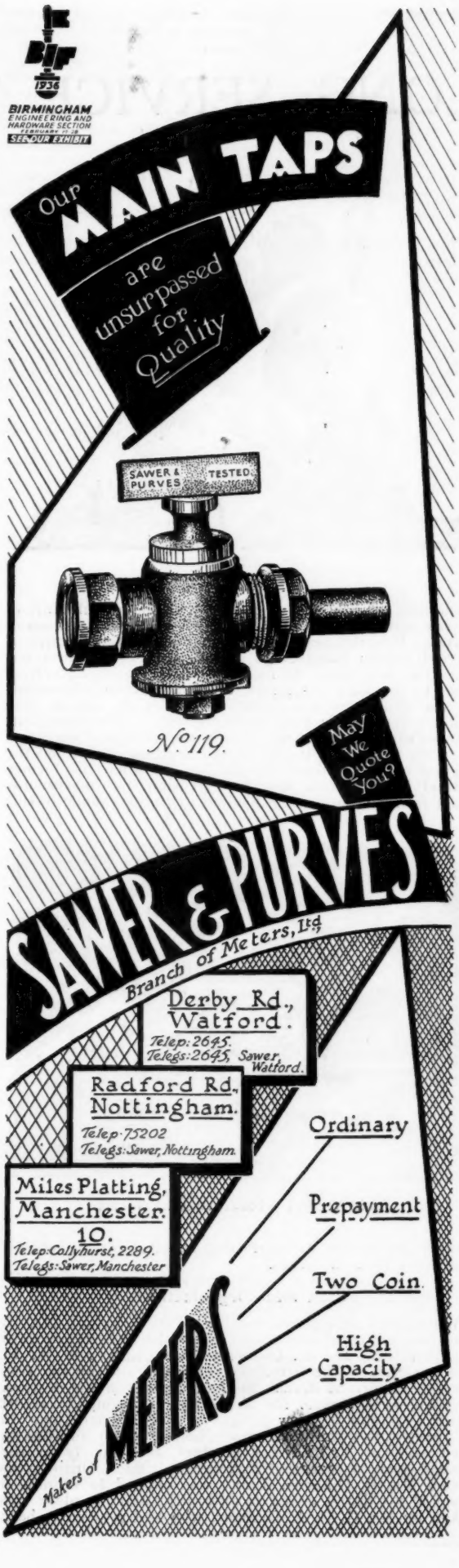
Many of the younger technicians who have been recruited by the Gas Industry during the last few years have been set to work, for very obvious reasons, upon problems associated with the utilization rather than the manufacture of fuel. The variety of technical problems associated with the utilization of gas, coke, and tar is to-day wider than that of the immediate problems of gas manufacture. This book has been compiled from many sources and should be made known to all engaged in the sale of fuel for industrial and other special purposes.

* "Technical Data on Fuel." Fourth Edition. Edited by H. M. Spiers. Published by the British National Committee of the World Power Conference, 36, Kingsway, London, W.C. 2. 1935; 12s. 6d. net. Postage, 6d. Crown 8vo. Pages, 374. Tables, 256. Diagrams, 66.

Gas Undertakings' Results

Yorktown (Camberley).

The report of the Directors of the Yorktown (Camberley) and District Gas and Electricity Company for the year ended Dec. 31, 1935, states that the gross profit for the year in respect of the combined Undertaking amounts to £23,494 and the profit and loss account shows that after providing for debenture and other interests, dividends on preference stock for the year 1935, and the dividend at the rate of 6¼% per annum less tax at 4s. 6d. in the £ on the consolidated ordinary stock for the half-year to June 30, 1935, there is a balance of £14,422 available for dividends. The Directors accordingly recommend that dividends at the following rates be declared for the half-year ended Dec. 31, 1935: 5% per annum on the consolidated preference stock and 6¼% per annum on the consolidated ordinary stock, both less income-tax at 4s. 6d. in the £. The ordinary dividend will absorb £3,237 in addition to the preference dividend already provided for, leaving £11,186 to be carried forward to the next account. The business of the Company continues to be satisfactory, gas sales showing an increase of 0·83% over 1934.



LONG SERVICE TO THE GAS INDUSTRY

A number of firms of long standing on the contracting and manufacturing side of the Industry have collaborated with the "JOURNAL" in the production of a series of articles, under the above title.

Gibbons (Dudley), Ltd.

The name of Gibbons, associated with the manufacture of fireclay material, became first known by the acquisition of a site at Dibdale, near Dudley, in 1834, in the vicinity of the well-known Stourbridge clay field. For the first few years the firm were chiefly engaged in supplying refractories to the local ironworks, &c., but shortly afterwards the use of fireclay gas retorts was starting, and in 1843 Gibbons made their first fireclay retort. Two important changes subsequently took place in the method of manufacture—the first when the Newcastle method superseded the original core ramming, and the second when the former method in turn gave way to extrusion by machinery. Apart from the increasing demand for retorts made in this manner, no further major developments of outside interest took place for some years.

Aerial View of Gibbons' Firebrick Works.

Staff and Organization.

When the firm suffered the loss of its principal, Mr. B. Gibbons, it was for some years directed by his widow until her two sons, Mr. B. Gibbons, Junr., and Mr. W. P. Gibbons, joined the firm. Towards the end of the century an important development took place in the decision to take on contracts for the supply of complete retort settings, embodying new designs in their construction. In this project the firm were greatly helped by the addition to their staff of Mr. Edward Masters, particularly in the change over to regenerative retort settings. During this period Mr. B. Gibbons, Junr., was obliged to relinquish some of his duties owing to ill-health, and his place was taken by Mr. G. B. A. Gibbons, who had previously been in charge of one of the stations of the Liverpool Gas Company. In 1895 it was decided to form two limited companies. The first, designated "B. Gibbons, Junior, Ltd.," was entirely concerned with the manufacture of fireclay products; the second company, "Gibbons Brothers Limited," dealt with the contracting side of the business, and with the manufacture of ironwork, for which a small works had recently been erected. On the death of Mr. B. Gibbons, Junr., in 1901, Mr. C. S. Bennett was appointed a Director. The Secretary of both Companies at their foundation was Mr. H. V. Stanton, who is Secretary to this day, and, in addition, occupies a seat on the Board.

Technical Development.

The end of the century was marked by a steady increase following the introduction of regenerative settings and by a short boom in inclined retorts, Gibbons being one of the pioneers in this system. This increased trade was carried into the early years of the present century, helped by three new developments. Firstly, the introduction of machine charging for retorts, for which Gibbons brought out their "Guest-Gibbons" machine; secondly, their commencement in the building of industrial furnaces for the various heat treatments of metals; and, thirdly, their early association with the Woodall-Duckham Company, who at this time were beginning to build vertical retorts. The ironwork manufacturing side of Gibbons Brothers increased rapidly during this decade, and their engineering shops were moved from the adjoining town of Dudley to a site contiguous with their Dibdale Fireclay Works.

Owing to the demand for fireclay goods, constant enlargement of the Works was necessary, and at about this time further extensive areas of mining land were acquired, and arrangements for getting the coal and clays on a much larger scale were made by sinking new shafts. New mining equipment providing a system of endless ropeways was installed for conveying the raw materials direct into the Works. It is interesting to note that just after this colliery development, silica refractories were being called for, and a separate unit was put down for the manufacture of this material.

The War, and After.

Immediately prior to the War the firm suffered the loss of Mr. G. B. A. Gibbons, one of the Joint Managing Directors, and certain new Directors were added to the Boards of both Companies.

The War period was devoted largely to direct and indirect Government work, the largest contract being the building of the National Projectile Factory at Dudley, while there was also great activity in the building of industrial furnaces.

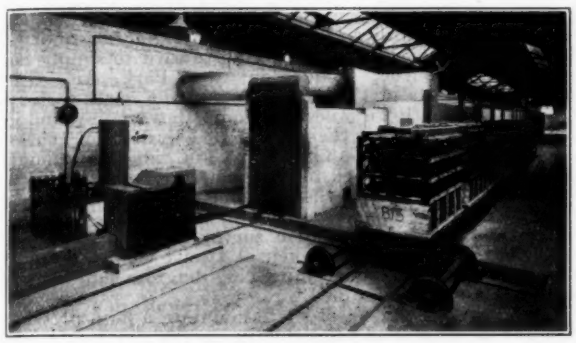
In 1919 it was necessary to increase the capital of the Companies, and it was decided to merge the two concerns from a financial point of view. Gibbons (Dudley), Ltd., was formed to act as parent Company, thus cementing the

interests of the manufacturing Company of B. Gibbons, Junior, Ltd., and the contracting and engineering business of Gibbons Brothers, Ltd.

The first seven years after the War brought large and numerous contracts for new coal carbonizing plants, and the firm was kept very busy with this work and the increasing demand for industrial furnaces. The output of structural steelwork continued to grow, and new engineering shops were built at Corbyns Hall, Pensnett, on the G.W.R. main line, having a capacity of 600 tons of fabricated steelwork per month. An iron foundry was also purchased at about this time, so that the firms were not only now self-contained for the manufacture of the various types of materials required, but were also able to supply outside demands, particularly in regard to steelwork and castings.

Silica and Other New Enterprises.

The output of silica was going up rapidly with the introduction of silica segmental retorts, and it became necessary



Dressler Tunnel Oven Firing Stoneware.

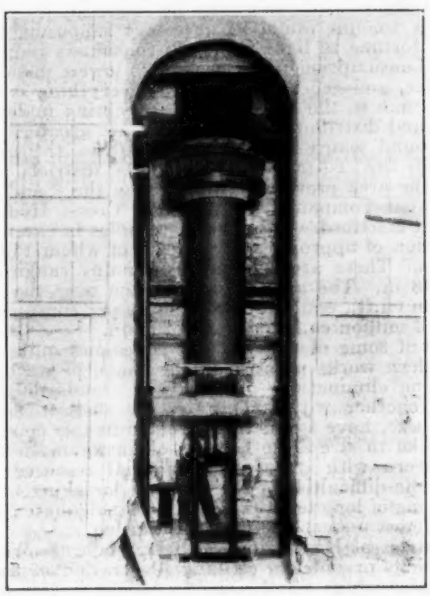
to erect works for the production of high-grade silica products for the gas and other industries. A completely new unit was accordingly laid down adjacent to the Corbyns Hall Steelworks, and has been enlarged from time to time.

Mr. W. P. Gibbons, who had been in ill-health for some years, died in 1925, and shortly afterwards Mr. Masters retired, Mr. C. S. Bennett becoming Chairman and Joint Managing Director with Mr. T. Allen, the present Managing Director.

In 1926 the Directorate showed foresight in embarking upon new lines of business, and the Company purchased outright three new businesses—first the Dressler Tunnel Oven Company, who were patentees of the modern tunnel oven method of firing pottery; secondly, the old established Harvey-Siemens Company, the original makers of regenerative steel melting furnaces; and thirdly, Gregson & Partners, a firm of furnace builders in Sheffield. At about this time licences were secured for the English and Dominion rights to build the "Kogag" coke ovens and the "Picard" intermittent chamber ovens. The majority of these newer developments have given good results, the Dressler acquisition being outstandingly successful. Over fifty ovens have been built since the acquisition of the business for firing a varied range of ceramic products, including building bricks, firebricks, wall tiles, general earthenware, porcelain insulators, stoneware, abrasives, &c.

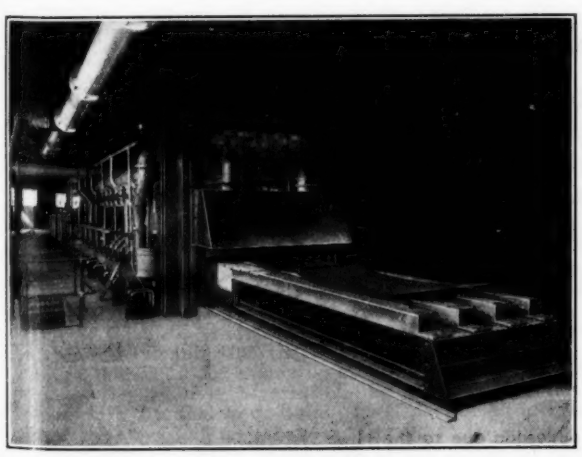
At the Company's Dibdale Works the firm showed its confidence in the newly acquired Dressler Tunnel business by installing the first tunnel kiln to be built in England for firing firebricks; this kiln is 300 ft. long and has a capacity of 100,000 bricks per week. The clay grinding and brick making plant has since been completely modernized, and a full range of fireclay, silica, carborundum, sillimanite, fused alumina, and insulating refractories are now manufactured. The value of research work has always been fully realized by the Company, and the original laboratory was replaced by a new, large, self-contained building.

During the last few years the firm have joined in the general trade revival, and it has been necessary to build a new suite of offices to house the increased staff of draughtsmen. Recent contracts include a large modern horizontal plant for the North Middlesex Gas Company, and a considerable number of smaller horizontal plants. The coking plant of the Cargo Fleet Iron Company has been reconstructed to a modern 1,000 tons a day unit, and several other coke oven plants have been erected. On the constructional steelwork section of the business the coal hand-

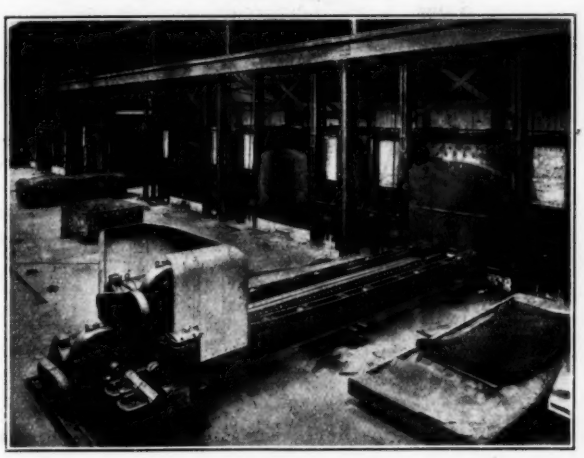


Retort Making Machine.

ling plant erected for the Wandsworth Gas Company, having a capacity of 200 tons per hour, may be cited as an example. The firm have also been exceedingly busy with the building of tunnel kilns and furnaces, the latter including a new type of sheet normalizing furnace which has been outstandingly successful. Town gas is now becoming more and more popular for industrial use, and this fuel has been applied to Gibbons' furnaces and tunnel kilns having a consumption of some 4,000,000 cu.ft. daily.



A Normalizing Furnace.



Sheet Annealing Furnaces.

The Distribution of Gas in Country Districts

by
T. A. WOLFE
(of the Tottenham and District Gas Company).

From a Paper presented to the London and Southern District Junior Gas Association at a meeting held in London on Friday, Jan. 24.

Distribution in country districts does not differ fundamentally from that in towns and large cities, the same broad outlines and basic principles apply, but a certain amount of adjustment of vision is required if the subject is to be fully appreciated and understood. For instance, instead of 36-in. and 48-in. mains, one must consider 3-in., 4-in., and 6-in., and certainly nothing greater than 18-in. Consumers per mile of main are much fewer, and whereas in London and the large towns to connect, say, 100 new consumers, 1,000 yds. of main may be required, possibly ten times that amount would be necessary supposing we had the good fortune to light upon 100 consumers requiring a supply. Consumption per consumer is lower, installations are smaller, and generally speaking, everything is several sizes less than in the larger towns, excepting undeveloped territory and distribution costs, which are greater.

The ground which I supervise comprises the northern section of the Tottenham Company's district, and is actually the area previously supplied by the "added" or amalgamated Companies of Waltham Cross, Hoddesdon, Ware, and Hertford. It is 79 square miles in extent, with a population of approximately 75,000, of whom 15,000 are consumers. There are 130 miles of mains ranging from 2 in. to 18 in. The annual consumption over the area is 400 million cu.ft., equal to 26,600 cu.ft. per consumer, and just over 3 million cu.ft. per mile of main.

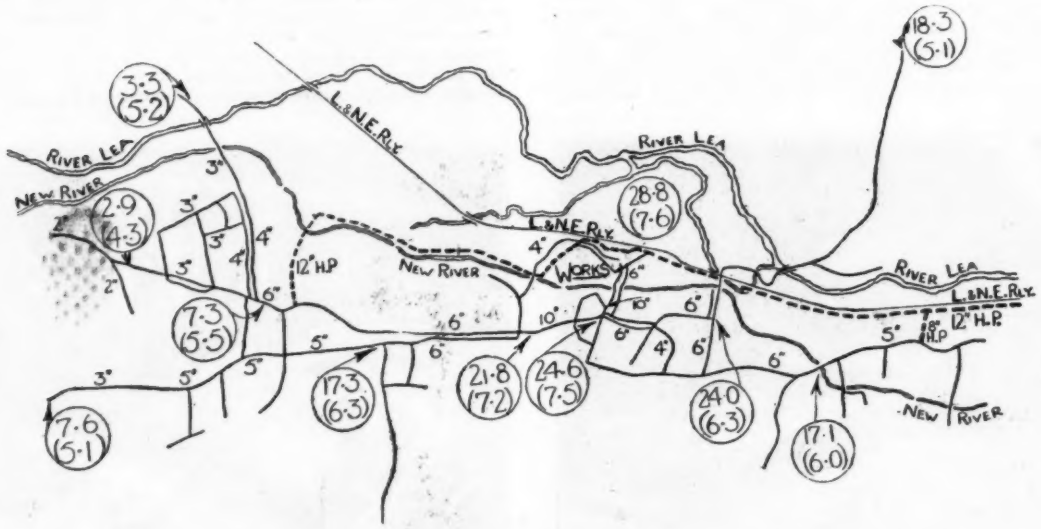
I doubt if some of our younger colleagues quite realize what modern works practice in the shape of washing for naphthalene elimination, dehydration, standardization of quality, together with having on the district mains of adequate size, have saved them from. In this connection, I would like to stress the benefits of amalgamation. The large concern with its greater financial resources clears away all the difficulties of the small undertaking to whom the re-laying of long lengths of main of inadequate capacity was an almost unbearable financial burden.

The district of Hoddesdon, with Broxbourne, Wormley, and Nazeing, provided a striking illustration of the difficulties under which small concerns labour in the struggle to cope with growing demands for gas by maintaining works and district in a serviceable condition, and at the same time selling gas at a figure which is reasonably low, while striving to provide an economic return on the shareholders' capital. If this was striking, however, the effect of the change of conditions wrought by modern methods, backed with financial support, was really startling. A few moments' perusal of the accompanying plan provides a most interesting study (see fig. 1). Mains 10 in. and 6 in. in diameter leave the works via New River Bridge and St. Catherines, the 6-in. branching south along Churchfields for Nazeing, Broxbourne, and Wormley, a 4-in. branch proceeding westwards to feed part of Broxbourne, and the 10-in. proceeding via Holly Walk northward to supply the rest of Broxbourne, Hoddesdon, Rye Park, &c. The furthermost parts of the district are in the north-east 2·3 miles, in the south 2·6 miles, in the north 2·7 miles, and in the east 4·2 miles from the works. The system, of course, quickly reduces to 6-in., 5-in., 4-in., 3-in., and 2-in. mains, and, as is usual in the customary contrariness of things, a very high percentage of the development has taken place in the area where mains are least in size and pressure loss is greatest. In July of 1931 a survey of the district was made and pressures were taken at twelve points at 12.30 p.m. on a Sunday, the accompanying diagram showing the remarkable results obtained.

It will be seen that in order to maintain a 3-in. pressure in a fairly densely populated area in the north-east and 2·3 miles from the works it was necessary to work 28-in. pressure at the source of supply, a pressure loss of 25 in. occurring. A loss of 19 in. occurred between the works and the most southernly point, a distance of 2·6 miles. When I tell you that this pressure was thrown upon the consumers' appliances and that service governors were not employed, conditions can be better imagined than described.

Upon amalgamation, the Tottenham Company quickly proceeded to set their house in order, but only those closely associated with the works and the district can fully appreciate the value of the good work done, and the misery of the interval of waiting.

The 12-in. high-pressure from the Ponders End Works was extended from the Waltham Cross Works via the railway line, the first branch being made at Wormley, where an 8-in. main was connected through Wharf Road to the 4-in. in the main road. The main proceeded to the works, where connections were made to the holders, and further continued via the roadway and the New River towing path to Essex Road, and connections were made to the existing



Improvement in District Pressures at Hoddesdon due to the New System.

Pressure Readings taken July 5, 1931. Pressure Readings Jan. 5, 1936, shown in Brackets.

6-in. in the road leading to Stanstead and Rye Park. Governors were, of course, inserted at the district connections, and limit valves control the supply to the holders. When boosting is taking place at Ponders End the supply at these points of connection to the district is actually taken direct, but at other times the gas is delivered in and out of the holders to both the town system and this main, in the ordinary way.

Gas making at the local works ceased in about September, 1932, and the effect of the change-over to the new system was amazing—in any case it was epoch-marking as far as Hoddesdon is concerned. A general levelling-up of the pressure was immediately effected and a further scrutiny of the map noticing the new figures at the identical points of the original observations renders further comment superfluous. This final result was not completely brought about by the above scheme, as naturally certain sections of the district required to be specially dealt with, such as Rye Park and Rye House, to which an 8-in. main was extended from the Essex Road connection.

Complaints.

That the installations and services all over the area are gradually being brought into a satisfactory condition is, I think, indicated by the relatively few "complaints" received from the districts.

"Complaints" is really a misnomer, as it covers such a wide range of notifications, but the chief item of interest under defective fittings is that elusive "will-of-the-wisp"—gum. Happily there are very few appliances which are affected by this, due to the fact, I suppose, that in most apparatus the gas is burned at a fairly high rate. The two places where we have found it, however, are (1) thermal storage thermostats, and (2) lighting fitting by-passes. In the case of the by-passes we find that the gum adheres to and carries forward minute particles of rust, but a definite film of gum builds up and sticks thermostat valves. The trouble became so insistent that a "control" of outside shop lamps is made nightly by a fitter's mate, while an inspection at about three weeks' intervals of certain thermostats affected is made, and the valves washed out with acetone. I am glad to say that in recent months the trouble has been less acute.

I think the following figures go to prove that the consumer has benefited:

Consumption.

—	1932.	1933.	1934.
Waltham Cross	118,732,000	140,042,000	149,401,000
Hoddesdon	67,602,000	71,975,000	79,286,000
Hertford	89,523,000	98,525,000	101,156,000
Ware	43,646,000	47,336,000	50,522,000

Sales of Appliances.

—	1932.	1933.	1934.	1935.
	£	£	£	£
Waltham Cross	3,875	3,369	4,296	7,193
Hoddesdon	1,726	4,426	5,058	5,007
Hertford	2,453	3,854	3,679	4,019
Ware	955	2,046	2,283	2,537

Extensions to Outlying and Country Districts.

I have already made reference to the beneficial effects of amalgamation upon the policy of renewals and repairs to the distribution system, and I cannot place too high a value upon it from the point of view of extensions to villages and outlying areas. I suppose the prime reason for any large Company operating in a congested and relatively small area, which is being rapidly built up and developed, seeking to acquire small Companies with their large tracts of undeveloped country, is to find outlet for their activities in the future.

Incidentally, we have experienced a little difficulty regarding laying in verges and banks bounding the roads, and although I think most concerns would expect to receive no obstruction in this, it is astonishing in how many places the surveyor will accept no responsibility for our taking that position. It has been held in the High Courts, I believe, that a verge is a highway or a street within the meaning of the Act, but this view is by no means shared by the man who owns the land on the other side of the hedge. Private building estates are specially dealt with by the New Buildings Department operating from the Chief Office—subsidies are paid to builders as an encouragement to the installation of gas points by them, but speaking generally, we find that the builder prefers the work to be done by the Company.

Mains and Services.

Although very great lengths of mains are put out to contract, much of the mainlaying work in the area is performed by a regular gang, the labourers of which are not, unfortunately, skilled navvies. Upon amalgamation, the works at Ware and Hoddesdon were closed down, and it was found necessary to absorb yard men, stokers, &c. Even so, working under uneconomical conditions our costs are not unreasonable, the average for 4-in. main being 9s. and for 6-in. being 12s. 2d. When an unusually long length has to be laid, extra temporary men are engaged with a consequent reduction. Modern methods of constructing roads in concrete are dictating our policy, increasing the difficulties, and creating new problems. Whenever possible, mains are laid in footpaths on each side of the road, so as to keep the carriageway clear of services.

In this connection the latest form of complication appears to be the practice which bids fair to become standard amongst local authorities, the laying of sewers in footpaths. The effect is to make it impossible to find a solid bed of soil upon which to lay our pipes with stability. The risks of subsidence causing drawn joints and broken pipes are therefore greater, and in one case it was found necessary within two years to knock-up about 16 joints in succession. In another part of the Company's district seven breakages occurred due to the same cause. Very little satisfaction appears to be forthcoming from the local authorities, and I should be glad of information as to experiences of members in other districts. It is a matter which I think might be investigated by the Senior Association, with a view to finding a formula.

In a general way services to ordinary houses are of 1¼ in. diameter, but as it was found that practice on the district varied to such an extent respecting lengths the following schedule was adopted:

Up to 10 ft. in length	1 in. (for supplying small properties)
Up to 100 ft. in length	1¼ in.
Up to 200 ft.—100 ft.	1½ in.
100 ft.	1¾ in.
Exceeding 200 ft.—100 ft.	1¾ in.
100 ft.	1¾ in.
Remainder	2 in.

Public Lamp Services.

Up to 30 ft.	1 in.
Up to 100 ft.	1¼ in.
Up to 200 ft.—100 ft.	1½ in.
100 ft.	1¾ in.
Exceeding 200 ft.	According to number and size of lamps

Standpipes.

Lamps up to 6-lt. No. 2 Burner	¾ in.
Lamps over 6-lt. No. 2 Burner	1 in.

This does not provide for services of unusual consumptions, which will be dealt with according to individual requirements. Standpipes should be a size less than the service.

Wherever possible top tappings are made, although where the main is less than 21 in. deep the main is drilled at the side and a hole not larger than 1-in. in 4-in. and not larger than 1½-in. in 6-in. mains is permitted. A reducing or, more correctly, an increasing bend is used for increasing from 1 in. (main elbows being taboo) and a split collar with a hole is fitted for larger tappings. Tubes are treated with bitumen and in certain circumstances are wrapped in hessian and coated.

All tubes and fittings which are of wrought-iron quality are supervised in manufacture and tested by British Inspecting Engineers, Ltd., this refinement being considered to be well worth its cost in rendering us free from irritating blowholes being discovered after connection. Generally speaking, services are laid "live," but if part is laid "dead" from the house this is very carefully air tested by means of a "U" gauge.

The Gas Fitter.

A considerable amount of attention has been given during the past few years to improving the status and education of the existing gas fitter and the training of the future fitter. Here again I ask you to adjust your ideas to the conditions in the small gas concern as compared with those in some of the larger undertakings, with facilities for training men. A boy became a fitter's mate, and if he was of ordinary intelligence and worked with a good fitter he emulated his mate and became a good fitter also. On the other hand, if the mate was a bad fitter, he again copied him faithfully and became in turn a poor fitter. Within the company and in the town no facilities were available for improving his knowledge or prowess. Realizing our deficiency in this respect, we approached the County Council about four years ago, and a start was made among the older men. The complete City and Guilds syllabus was adopted, and the scheme very soon extended to include juniors. This year (the fourth) there are four practical classes going, accommodating 1st, 2nd, and 3rd

year students, all of whom are enthusiastic. All new employees to the ranks of fitter's mates are engaged upon the condition that they attend the classes; boys engaged in "blind alley" occupations, such as showroom cleaners, are engaged on the same terms, in order that at the end of, say, two years they will be capable of becoming qualified mates. Applicants for situations, such as boys of 14, who have left school and are not eligible for employment with the Company until they are 16, are recommended to attend the classes. By this means we hope gradually to form a nucleus of trained lads to be available as required.

The Company does everything in its power in the shape of returning fees, granting of leave with pay, supplying tools, appliances, and materials, to encourage and help the scheme, and I think our efforts have been justified in as far as the men really do know more about the theory and practice of gas fitting. Practically every fitter, fitter's mate, and showroom boy is an accomplished joint wiper, and very proud of his achievement—although, fortunately in these days of growing popularity of the copper tube, we are becoming less dependent upon this rather over-rated item.

The general training in every branch, however, is extremely valuable to fitters in country districts, where the work is much more comprehensive in character, due to the relatively small amount of any particular class of work calling for specialization. I wish I could say that it is reflected in a raising of the standard of work on the district, because in this respect I think results are definitely disappointing. I have as yet to observe that, speaking generally, the men are cleaner and more tidy, more considerate of consumers' property, and more careful of the Company's interests in respect of waste and damage to appliances and tools, &c. Then, too, although the classes have the effect of improving the craftsman's skill, they do not teach him to become a good gas man—*i.e.*, a man who can quickly diagnose a complaint, trace a remote escape, sympathetically deal with a consumer's difficulty in using appliances, &c.

Sales Policy.

Much has been done to encourage the gas fitter and district man to push the sale of appliances, in the shape of commission, not on a percentage basis of the cash value but a definite sum per appliance. Maintenance men are supplied with copies of notices regarding new appliances and alterations in prices, while a recent innovation is a monthly publication edited by the Company's Sales Superintendent whereby a link is established between every salesman (*i.e.*, every employee of the Company) and the Sales Department. A great step forward was made about one year ago when the Company decided to include the fixing charge in the purchase price of the appliance. By this means the veriest novice, provided he is armed with the price, can effect a sale on the spot without having to call upon the services of a skilled estimator.

The commission scheme, besides being applied to district representatives, has been found to be useful in shops and inns, where appliances such as coke fires and water heaters are installed. A satisfied user displays a showcard, and is supplied with a manifold memo book in which is recorded all enquiries. The copy is forwarded to the local office, who follow up, and where a sale is effected the commission is duly paid to the innkeeper or shopkeeper.

The Slot Consumer.

Slot consumers are specially catered for in the shape of being given facilities for obtaining appliances not generally included in the prepayment installation.

By agreement with the consumer, gas fires, gas irons, and coke fires may be hire-purchased by means of adjusting the meter so as to pass less gas per penny than the standard rate until the purchase price has been recovered, the rates being:

Gas iron	Adjustment	1	cu.ft. per 1d.
Gas fire	,,	2	,, ,,
Coke fire	,,	2	,, ,,

It will be thus seen that in the case of the gas iron, as the meter setting is 16 cu.ft. per 1d., the value of 1 cu.ft. is $\frac{1}{16}$th per 1d., and when 1s. 4d. has been inserted 1d. has been paid off the iron. Similarly with the gas and coke fires, 1d. has been paid off when 8d. has been inserted. Considered in pennies, perhaps, this seems rather a hopeless proposition, but it is interesting to note that the average times taken to complete the payments are:

Gas irons	3 years
Coke fires	4 ,,
Gas fires	6 ,,

The system is known as the "option" scheme and has worked very well for a number of years. Gas cookers are not included, but under an extraordinarily favourable plan the slot consumer is enabled to purchase an all-enamelled cooker, complete with two boiling burners and grilling burner, stand, &c., for the sum of £5 cash, or it may be taken on hire-purchase at 5s. per quarter spread over five years. Needless to say, the cookers sell like hot cakes, the chief difficulty being the maintenance of an adequate supply to cope with the demand.

As is common to, I suppose, all gas undertakings, slot installations are free, but we also include a free copper where required. Council housing estates are specially dealt with, and an installation comprising service, carcass, lighting fittings, complete with burners, globes, and mantles, copper, and cooker is made free of charge to the Council. Where lighting is not taken, a charge of £2 is made as a contribution towards the cost of service. I am pleased to be able to tell you during the past two years five estates have been dealt with in this way on four separate Councils' areas.

Lighting.

From the above it will be appreciated that the Tottenham Company is making a very determined effort to obtain and retain slot lighting, but I am not certain that we are doing enough. It is superfluous for me to refer to the many points of view held, and the amount of discussion that has taken place among gas men, as to whether this load is worth keeping. It is generally accepted that to assist in this, some form of systematic free maintenance is necessary and the visits should not be fewer than twice a year. From careful records we have made and from my own observations it appears that it is possible for one man in a week of 48 hours to deal with 74 installations. The rate of pay in my area for this class of work is 1s. 1d. per hour, and the cost is therefore £2 12s., or 8·4d. per installation per visit.

Some of the Council estates are gas lit, and others are fitted with cookers and coppers only. Owing to the good offices of the Secretary's department I have caused to be extracted annual consumptions on these estates, which are interesting to compare. Without worrying you with the actual calculations I am able to state that the average consumption per gas-lit house is 22,000 cu.ft. per annum, and the figure for the house with cooker and copper only is 12,000 cu.ft. per annum. As the average rate recovered for gas consumed by the coin meter is 1s. per therm it follows that our revenue is £2 10s. less per annum in one house than the other.

Recent free installations complete with lighting made under the terms indicated above cost £2 per house more than the other type, the interest and depreciation at 10% on this figure being 4s. This, together with the annual cost of maintenance (assuming two visits per annum) *plus* the interest of 5% on the £2 not received as a contribution toward the cost of service, is, as I see it, the cost of obtaining and retaining the lighting load for one year in each house, so far as Council houses are concerned. Dividing the figure thus obtained by the number of therms used for lighting reveals the cost as 1·8d. per therm—in other words, a discount of less than 2d. per therm from our highest-priced gas.

Although systematic lighting maintenance is not carried out, we have in operation what is virtually a comprehensive maintenance scheme among slot consumers. A number of fitters are steadily working through the whole of the area, and their job is to overhaul installations completely, including cleaning and greasing maincocks, cleaning and adjusting cooker burners, &c., and giving special attention to lighting fittings. Where necessary a burner set with globe and mantle is supplied without charge, and mantles are sold at 1s. 6d. for six. Where 1s. 6d. is more than the consumer can pay, the cost is shared with a neighbour, but a box is only broken on condition that the whole are to be sold at one time.

Water Heating.

This is the day of multi-point instantaneous machine, and we, in common with most other concerns, supply this form of heater on rental terms, which include fixing. Much is made among gas salesmen that from the point of view of electrical competition the instantaneous heater is "*plus* a little something that others haven't got." From both the works and the distribution engineer's point of view, however, it is just this "little something" which might ultimately prove a serious embarrassment so far as holder storage and mains capacity are concerned. We often say that were the electricians faced with our Sunday dinner-time load their case would be hopeless, and I think that were every consumer in the area supplied with an instantaneous water heater consuming about 150 to 180 cu.ft. per hour, and they together decided to have a bath, we should be in a similar position.

I am strongly of the opinion that the instantaneous

heater is the consumer's appliance, and the thermal storage the undertaking's appliance. Speaking as a consumer who has used both types for many years, I think the thermal storage fitted with due regard to requirements and intelligently used has everything in its favour.

In this connection I am particularly pleased with a new system of charging recently introduced by the Tottenham Company, applicable only to thermal storage and central heating. A minimum load per house of 250 therms per annum at the domestic rate is required, after which all gas used on the water heater is charged at 4·8d. per therm. Few contracts so far have been made, but I feel that the prospects of the circulator and the thermal storage heater have definitely improved.

Discussion.

The PRESIDENT (Mr. J. M. Webber, Croydon), in opening the discussion, said that Mr. Wolfe had given them a most interesting record of the work his Company had carried out in bringing an inadequate distribution system up to present-day requirements as well as the requirements of to-morrow. His Undertaking were to be heartily congratulated upon the work they had done, and one could not help feeling that it must have meant a great deal of very hard and anxious work. He had been pleased to note the Author's remarks in regard to the importance of gasfitters doing tidy work, because the fitter was the gas undertaking's " ambassador;" he represented the undertaking. The various chiefs might be very charming men—but the average consumer never saw them. Mr. Webber remarked that he was rather surprised at the reference to an electrically-driven booster supplying the district as distinct from boosting into the holder; and in this connection he inquired what the effect of an electricity breakdown would be if it occurred during a boosting period. He believed that the Tottenham Company had a very ingenious system for controlling holders at distant stations; he asked if in such instances the holder disconnected itself when full.

The President, in conclusion, referred with pleasure to the presence on that occasion of Mr. S. B. Chandler, Distribution Superintendent to the Tottenham and District Gas Company. Mr. Chandler's name would always be remembered as one of the most active of the early members of their Association and one who had done an enormous amount for them in those difficult days.

Advantage to the Small Undertaking.

Mr. S. B. CHANDLER (Distribution Superintendent to the Tottenham and District Gas Company) congratulated Mr. Wolfe on his Paper, which came at an opportune time having regard to amalgamations which had recently taken place and which he foresaw would continue to the benefit of the Gas Industry. Scattered throughout the country were many small works which, while quite efficiently managed, were unable, mainly owing to financial reasons, properly to meet the demands of the modern consumer, and were forced to see inroads made upon their business due to inability to possess proper showrooms and technical staffs, in addition to catering for the needs of new estates by the provision of adequate mains and the many services which represented high capital expenditure. Amalgamation with an undertaking willing to expend money in the provision of these very necessary services in small country districts meant all the difference between incomplete service, for which the small undertaking could not either be called to task or blamed, and the coming into being of an organization which was as efficient as that of the parent company. It was obvious that amalgamation based on a proper realization of present-day requirements meant not only better conditions for the consumer, by making available to him the purchase and hire of modern appliances and skilled technical advice, but the district itself benefited by the ability of the new undertaking to expend capital for the provision of showrooms, mains (of particular importance where new estates were concerned), special tariffs designed to meet competitive fuels, modernization of street lighting, transport and delivery arrangements, reduction in prices of appliances due to increased purchasing facilities—in short, the application in miniature of an organization built upon many years of experience.

The Author had shown the steps taken to introduce new methods into the area which he controlled. Mr. Chandler thought he would agree with him that the application of Tottenham distribution methods had been of benefit to the area, and consumers now had an excellent service at hand which completely satisfied their requirements and of which they were taking full advantage. He had noticed with some interest the point raised by Mr. Wolfe regarding standardization of practice and policy throughout the Industry. Everyone would agree that greater uniformity in terms and conditions of gas supply was desirable, but he foresaw many difficulties which would prevent the carrying into effect of the suggestion. The Industry was certainly paying considerable attention to some of the matters mentioned, and, as they probably all knew, committees had for some time been sitting in order to bring about some form of standardization in connection with fittings, &c.; and the adoption by the Industry of the British Standard recommendations was going to help matters very much. It was certainly a little disconcerting to a consumer moving from one undertaking's area to another to find that conditions of gas supply, rentals, and terms of business differed from those to which they had been used. The removal of anomalies of this kind might materially assist business. There were, however, so many factors of a political and financial nature to be considered that he was afraid, however much they might desire it, absolutely uniform conditions could never be effected, although he was in accord with the Author's suggestion that The Institution of Gas Engineers might, at some time or other, look into the whole matter. The closer one could get to uniformity in practice and application, the better for all concerned.

The Hertford Company, continued Mr. Chandler, was exceptionally well managed and stood high among country undertakings. Much credit must be given to the late Engineer and to Mr. Wolfe for that state of affairs. The Gas Industry was facing a period of intense competition—protagonists of rival forms of heat energy were making strenuous bids for their business, and attacks were constantly made upon their loads, while in addition one learned of campaigns such as the obtaining of a " million new consumers " for electricity. He did not need to stress the importance of attention to those proposed inroads into their business. Equanimity and self-satisfaction at the excellent position attained by the Industry must not blind them to the necessity for further and greater efforts. Schemes of personal representation together with the application of technical skill must be evolved and put into practice.

" Limiting " the District.

Mr. SHANN (Gas Light and Coke Company) congratulated Mr. Wolfe on the scope of his Paper, and went on to ask if the Tottenham Company had any " limiting value " in regard to whether an extension of mains was worth while or not, taking into consideration the price of gas per therm. The Author had mentioned the laying of mains in the verges alongside roads, which raised the question of whether undertakings were actually permitted to lay here or not. In his own Company they had frequently experienced objections to their laying mains in the verges; but provided they had a customer further along the road who had applied for a supply of gas, he thought that they had the right to go along the verge. Sometimes surveyors refused permission to use the verge on the grounds of possible damage to the roadway through taking away the banking. Mr. Shann enquired whether Mr. Wolfe's figure for the cost of main-laying included reinstatement. There seemed to be little escape from the difficulty entailed by sewers being laid under footpaths. The use of steel mains instead of cast iron was a possible way of surmounting the difficulty.

Mr. P. RICHBELL (Croydon) observed that he was rather surprised at the very bad pressures prevailing on Mr. Wolfe's district at the time of amalgamation and congratulated him on the way he had tackled this problem and brought the supply to its present condition. They found things fairly bad on a district recently taken over by the Croydon Company; but they were not nearly so bad as in Mr. Wolfe's district. He most certainly agreed that amalgamation of small undertakings with their larger neighbours was most desirable. The financial resources, administration, and service available in the larger undertaking generally led to considerable improvements in the conditions prevailing on the district which, in turn, reflected on the whole Industry. He could appreciate that Mr. Wolfe was surprised that the traffic had not broken the 6-in. main at the bridge near the Government Powder Mills. He remembered a similar case on his own district where a 6-in. main was discovered with only 6 in. of cover, over which very heavy traffic had passed for many years. The only reason for altering this main was the necessity to increase its size to 12-in. diameter. He asked the author to give details of the type of fan and non-return valve used in conjunction with the boosting plant mentioned.

The Author had stated, continued Mr. Richbell, that it was necessary to lubricate " Newbridge " governors every twelve months. He was rather surprised that this attention was required so frequently. Was it, perhaps, due to dry gas being used? Mr. Wolfe had also stated that it had been necessary to relay a large number of services due to ground being waterlogged. Mr. Richbell suggested the corrosion of the services was due to the nature of sub-soil in which the services were laid rather than to the ground being waterlogged. Had the Author taken any special precautions with regard to the protection of barrel in this locality? In regard to laying mains in verges and banks bounding the roads, they had always assumed that the centre line of hedge or fence was the boundary of private property, and he did not remember any case where this question had been raised.

Other Services Under the Footpath.

Under the heading of " Mains and Services " the Author referred to the practice of Local Authorities laying sewers in footpaths where concrete carriageways were being constructed. They had had similar experiences in their district, and they were at that time dealing with an estate of 4,500 houses in connection with which it was proposed to lay sewers and *surface*

water drains in footpaths. He agreed that it was difficult to find a satisfactory bed for mains, particularly in curved roads where the sewers swung from one side of the footpath to the other, and he certainly thought this a matter which The Institution of Gas Engineers should take up with the Local Authorities. He was very pleased to note that the Author arranged to examine his plant prior to reconstruction of roads by Local Council. The Croydon Company made similar arrangements with their Councils. In fact, in several cases they submitted an annual programme of works to be carried out and when it was proposed to commence. The Company, in turn, advised the Councils of the roads in which they proposed to examine their plant and arranged for their work to be completed in advance of the Council's operations.

In regard to schedule for sizes of services, Mr. Richbell was rather surprised to note that services between 10 ft. and 100 ft. in length are laid with 1¼-in. barrel. They found that 1-in. services up to between 70 and 80 ft. in length for three and four bedroom houses were quite satisfactory. He asked Mr. Wolfe if there was any particular reason for adopting his schedule. In the case of standpipes for lamps, they always used ¾-in. barrel. They also found there was a tendency for rust to accumulate in the bend at the base of the standpipe, and for some years past they had used a ¾ in. by 1 in. by 1 in. tee with short tail piece, which had practically eliminated the necessity for clearing services for the reason mentioned. They tested all their services to 18 in. W.G. before connecting to main to ensure that the joints were sound. Their barrel and fittings were tested by British Inspecting Engineers at the source of supply.

In regard to housing schemes, continued Mr. Richbell, he noticed that the Tottenham Company asked for £2 for the service only. Did he infer from this that the main was laid free of charge? Generally speaking, his Company had had no difficulty in obtaining a reasonable contribution towards the cost of the main together with an amount approximately similar to that mentioned in the Paper for the service pipe and, of course, for any carcassing work which might be carried out by the Company. He was sure that they would all like to see a greater standardization, but he was afraid there were many difficulties in the way.

Fundamental to Sales Policy.

Mr. W. A. BISHOP (Croydon), in the course of a written contribution to the discussion, stated that a sound distribution system, with adequate pressure at all times, without wide fluctuations, was fundamental to any sales promotional policy. When taking over new districts, mains and services must be thoroughly overhauled before the selling of apparatus was embarked upon. The distribution system was the basis of good service, without which, though they might be able to sell a good deal of apparatus, they could not hope to sell gas *service;* and it was only through service that they could consolidate their business and make it proof against competitive agents. In outlying districts which were comparatively sparsely populated, it was, as Mr. Wolfe pointed out, not easy, in all circumstances, to build up consumption per mile of main and consumption per customer, but patient persistence in this case brought its own reward. The Croydon Company found this to be the case when taking over the Oxted District. They acquired this Undertaking in 1931, and at that time the consumers numbered 1,181, and the sale of gas was 35,136,600 cu.ft. per annum. For the year ended December, 1935, the number of consumers had increased to 1,575 (an increase of 33·36%), and the annual sale of gas to 43,521,800 (an increase of 23·86%). The average consumption per customer when the undertaking was absorbed was 29,194 cu.ft., while to-day it was 27,160—the fall being due to the weeding-out of much inefficient equipment and to changes in the calorific value of the gas—"500" quality now being supplied. The number of consumers per mile of main showed an improvement.

Building up business, particularly with the poorer class of customer, was possible—not necessarily with large apparatus, but by giving prominence to small aids to domestic convenience and comfort, such as poker burners, portable heaters, dual-purpose coppers—*i.e.*, coppers fitted to deliver hot water to the bath—while washing machines, if made available on easy instalment-purchase terms, make a wide appeal. It was necessary to make sure that customers properly understood the appliances they had, and that they knew how to get the best duty from them. Furthermore, appliances must be kept up to concert pitch through the medium of a house survey and maintenance scheme. Complaints were to be welcomed, and should be periodically analyzed; then they could see something of their customers' reactions to their service. Customer-reaction was the most important thing to consider in regard to all matters, but particularly with regard to tariffs, installation policy, and faults. Fortunately, they were not troubled with gum in Croydon, and their oven thermostats, hot water thermostats, and other similar devices caused surprisingly little trouble.

Sales of Apparatus.

It was a good thing to cultivate the sale of apparatus rather than hire. It helped to consolidate business, and his Company were doing all they could to develop the "customer-ownership" of apparatus idea. More care was taken of the apparatus, and people were less inclined, when they had paid a few instalments, to return it in favour of competitive equipment. Being on the spot with one's mains when estates were developing was very important. It cost a lot to get in afterwards, but this could be done. For various reasons, some years ago, they were unable to reach the Monks Orchard Estate, and electricity had a good run. To-day, practically every house was using gas, and many electric cookers had been displaced. All gas fitters' assistants underwent a five years' course of training. Various refresher courses were held for fitters from time to time, and demonstrations of new apparatus given.

With regard to business development, the trading policy should be simple and well defined. The underlying principle was to make it easy for customers to patronize them. Hire rates, instalment-purchase terms, and cash prices should be inclusive. There should be no irritating "extras" for fixing. They had developed, with some measure of success, the "pay-as-you-burn" theory. In the case of the Croydon Company sales of apparatus for the year 1934 were £89,923. The figure for 1935 was £128,326, showing an increase of £38,402, a result largely brought about by increasing the facilities for people to acquire apparatus on inclusive instalment-purchase terms.

Space heating presented enormous possibilities. At the moment they had twenty-five central heating plants at work, having, in the aggregate, an hourly gas rate of 11,747 cu.ft. Domestic water heating and large scale water heating also presented wonderful possibilities. Quick recovery thermal storage was better than the instantaneous principle, where space permitted, particularly when one had been used, during the winter, to a quick hot water service from a coke boiler. However, the multi-point water heater had "caught on" enormously, and they had in use on the district about a thousand.

It was a good thing to regard every employee as a salesman. His Company had paid commission since June, 1915, and they made it clear that *any* employee was entitled to commission on a transaction which he introduced, even though he might be quite outside the Sales Department. It was good to see that the industrial and large apparatus specialist was at last coming into his own. No gas undertaking of any size could afford to be without an Industrial Gas Sales Technician.

In load building, it was well to remember that 60% of the total consumers in the country were slot consumers, but that collectively they accounted for only 40% of the gas burnt. Therefore the motto was "Cultivate slot consumption." Mr. Bishop's Company preferred to give an adequate rebate, out of which to take rents of extra apparatus, rather than to set back the meter for reimbursement. They felt that this latter practice, if carried too far, might give rise to the idea that gas was dear. Most of their consumers were, of course, stop-action consumers, not slot consumers, but he would give details of their slot settings.

Slot Meter System.

(All Districts except Oxted and St. Helier.)

	Per 1,000 Cu.Ft. s.	d.
Meters set at—		
15 cu.ft. per 1d.	1/	
180 cu.ft. per 1s.	5	6·666

	Rebate. s.	d.
Installation consisting of—		
Meter only	1	6·666
Meter and lighting fittings	1	3·666
Meter, lighting fittings, and black cooker	0	6·666
Meter, lighting fittings, and enamelled cooker (5d. per week)	0	0·666
Meter and black cooker	0	9·666
Meter and enamelled cooker (5d. per week)	0	3·666

From statistics taken out, the prepayment lighting load per customer was worth about 6,000 cu.ft. per annum. They were to some extent resisting the invasion of electric lighting by pushing lighting switches, and during the year they had fitted 2,342. It helped a little. A copper and a gas fire in a small house just about made up the loss of lighting, and they might be interested in the following table of specific consumptions of various apparatus.

	Family of, say, 4. Annual Consumption Cu.Ft.
Lighting	6,000
Cooking (say, 50 cu.ft. per day)	17,500
Copper	3,200
Geyser	3,400
Sink heater (usually transfers the load from cooker hotplate, consequently is of little value as a load builder)	5,000
Bedroom fire	3,000
Dining room fire	10,000
Refrigerator	6,000
Multi-point water heater or medium consumption thermal storage water heater	20,000
Poker burner	3,500
Iron	750
Portable heater (10 cu ft.)	2,400
Hall radiator (small)	3,000

The cooker load, from statistics taken out in 150 cases of small houses in this district, had been shown to be worth 13,400 cu.ft. per annum, but wide variations occurred, due to the habits of people. The figure given was an average.

In Mr. Bishop's view, there was no such thing as "con-

sumer's appliances" and "Company's appliances." What was proper and right for the customer is good for the Company. The Company gained if the customer was satisfied. There was much to be gained, of course, by unification of policy. The more united their front became, the stronger they were. Variations in tariffs, installation policies, discounts, &c., were anomalies in the eyes of the public. Every effort should be made to narrow down variations in their trading conditions.

Electricity in the Villages.

Mr. C. A. DEAS (Hertford), referring to the Author's observation that if, on amalgamation, advantage of the added ground is not quickly taken its asset would be lost by reason of the fact that electricity would get in first, said that this had been brought to his notice recently in a small village in the eastern counties a few miles from a large town. In this village they had not heard of gas, though there was plenty of electricity. Such a state of affairs was common in many country districts, in which electricity authorities were piling on the price in order to enable them to sell more cheaply in the towns. Mr. Deas went on to stress the value of the Widlake pressure indicator. The man in charge of the retort house could by its means see at a glance how the pressure stood on the district and could act accordingly. It was thus possible to maintain a "straight-line" pressure all over the district, and it saved a lot of unnecessary boosting while enabling one to meet a sudden demand when it came. Previous to the installation of the Widlake indicator the booster had to be put on by guessmark. Mr. Deas went on to suggest that gum was due to the length of time the gas was in storage; in the winter they experienced less trouble from this source than in summer, due to the shorter period of storage. Another cause might be attributed to the efficiency or otherwise of the oil washers.

At Hertford and Ware, said Mr. Deas, the lighting load accounted for 30% of their output—which was a very important matter. The Author had stated that the load from the Hertford Works began to tail off at 9 p.m. in the winter, and that he had never really satisfied himself as to the reason for this. Mr. Deas suggested that it was due to the fish-fryers shutting down their apparatus about this time. Mr. Deas went on to describe the operation of the limit valves referred to by another speaker. As the holder filled up it caused a weight to drop, and when it was full the weight came to rest on the top of the valve, causing it to cut off the gas. As the district drew upon the storage and the holder began to fall again the weight was lifted off the valve, which thus opened the supply once more and allowed the gas to enter. In the event of the fan booster stopping through failure of current the gas would continue to pass through it.

A MEMBER enquired how the distribution engineer estimated the practical limits of a system; was it arrived at in respect of cost per therm, yards of main per consumer, or estimated future development, and when did the ordinary distribution system stop and the bottled gas area begin? He enquired what the Author's views were on this latter system.

Mr. F. C. SMITH (Gas Light and Coke Company) referred to Mr. Wolfe's observation that "happily there were very few appliances which were affected by gum, due to the fact that in most apparatus the gas was burned at a fairly high rate." Was there any experimental evidence, asked Mr. Smith, to support this statement? This trouble had been less acute in recent months by reason of the shorter period of contact in the holder. Had the period in the holder been shortened deliberately? Also, was the gas-drying plant at the inlet or outlet of the holder? Mr. Wolfe had referred to the extensive use of governors, and Mr. Smith enquired if he had experienced any trouble from gum in these. Many gas undertakings would like to extend the use of governors, but were hesitant to do so on this account. Mr. Smith also asked what kind of protection was being used on the mains and what methods were employed to test the effectiveness of the protection. He would like to know what experience Mr. Wolfe had had of copper tubes with capillary joints and what was his opinion of these joints? In regard to the lighting load, there was one aspect which the Author had omitted to mention. This load was valuable from other points of view than Mr. Wolfe had suggested. It was an interesting fact that a high percentage of electrical revenue came from a small portion of their load—namely, from lighting. The value of the lighting load to the electrical industry lay in the fact that it was a high-priced load which subsidized the other loads and enabled them to enter into competition with gas at a rate lower than the average price charged off the grid. Mr. Wolfe had referred to the question of training the staff and mentioned some disappointment in the results obtained. But he must not be discouraged, said Mr. Smith; larger undertakings than his were experiencing similar difficulties. It would come out all right in the end.

Mr. H. J. RISBY (South Metropolitan Gas Company) remarked that had they had the opportunity of putting in bottled gas in a village to which they were contemplating extending their mains they would gain considerable advantage—particularly in a case like that mentioned by the Author—where gas and electricity were "racing" towards the same village. Mr. Risby considered that the scheme for including the fixing price in the cost of the appliance was an admirable one. There was nothing more annoying to the consumer, having ordered an appliance, than to have several people "drifting around"—an inspector, the delivery man, and finally the fitter.

Mr. R. SUMMERSON (Luton) asked whether the consumption per consumer in Mr. Wolfe's district was going up or down, as this was the chief criterion.

Mr. J. GRAYSTON (Lea Bridge) enquired as to the attitude towards the Company in regard to wayleaves and right of access when laying mains. What was the general policy regarding the payment of such wayleaves?

The Author's Reply.

Mr. WOLFE, replying to points raised in the course of the discussion, dealt first with the question of electrical breakdown and the effect upon the boosters. They had very few such occurrences, he said, and those that had occurred had not been at times when the boosters were in operation. They had never experienced a breakdown while boosting. As regards limiting the district, they had no definite formula; but they tried to visualize future development. His Company laid mains at the bottom of hedges and banks, and they entered into agreements with the owners of adjoining property, and, generally speaking, they received every encouragement and help. Surveyors encouraged them to lay their mains in the verges, and in only one case had they had any objections. He did not think there was any reason for their lubricating their governors once a year except that this was the normal routine; he was not aware of the dry gas having any effect on the pistons. In regard to the waterlogged services, he wished to make it clear that these had been in such a poor condition that water had actually entered the system through the service pipes. All the services in the area were perished. They adopted bitumen for protecting all services.

The ownership of verges was a very difficult problem. They had adopted 1¼-in. service pipes because of the growing popularity of the instantaneous water heater. They laid mains free of charge to housing estates, and they covered themselves by stating that any contribution they received was for providing the supply of gas. This was stated in the contract. As regards gum, it was generally accepted, said Mr. Wolfe, that this was present in the gas in small globules, and if the gas was in the holder for a long period the globules of gum fell to the bottom and were carried forward in the heavier gas stream. This, of course, was only theory.

The Tottenham Company, continued Mr. Wolfe, had just entered into an agreement to supply Calor Gas, and they were at the present time dealing with the results of a recent canvass. Some while ago Mr. Wolfe received instructions to prepare a report in which he gave the names of all villages where gas was not available. Certain of these were earmarked for a future supply of gas, while others, to which it seemed not possible or worth while to extend their mains, were canvassed for a supply of Calor Gas. Villages where a future supply of coal gas was to be made available were canvassed for Calor Gas for the time being, and those houses taking such a supply were adequately carcassed so as to be ready for coal gas when it arrived.

Generally speaking, they experienced gum in by-passes and thermal storage heaters; they rarely found it in oven thermostats. In fact, gum only seemed to be present where there was friction due to the small aperture through which the gas had to pass. Very few cases of gum on district governors had been brought to his notice. Most of the gum was deposited on the works governors. They had used copper tubes for some time, and were just taking up the use of capillary tubes, which seemed to be very admirable fittings and much cheaper than other forms of tubing. There was probably a great future for this form of fitting.

The fact that a high price was charged for electrical lighting rather seemed to bear out the suggestion that the Gas Industry should charge the lowest price for lighting and provide the best possible maintenance. Mr. Wolfe said that he had no figures regarding consumption per consumer; but there was a tendency for this to fall. So far as the attitude of the Epping Forest Commissioners was concerned, they had entered into an arrangement whereby the Gas Company paid a fixed sum down and a charge of 2s. 6d. per annum.

Vote of Thanks.

Mr. R. SUMMERSON, in proposing a vote of thanks to Mr. Wolfe for his Paper, remarked that the Author had made a good case for amalgamation being of benefit to country districts. The Tottenham Company appeared to retain the previous staffs when they took over smaller concerns, which meant that consumers continued to deal with local men, which maintained that personal interest and contact which they enjoyed before. It enabled them to feel that the undertaking was still in local hands.

Mr. F. C. SMITH seconded the vote of thanks, which was heartily accorded.

Members of the University of Birmingham Metallurgical Society visited the works of the Wellington Tube Works, Ltd., at Tipton, on Wednesday, Jan. 29. A very pleasant and instructive afternoon was spent in witnessing the various operations of tube and fitting manufacture, and the numerous manipulations in connection therewith. The party was welcomed by the Chairman and Managing Director, Mr. Douglas W. Turner, and Mr. J. T. White, General Manager and Director. At the conclusion of the visit the members were entertained at tea, when an interesting discussion on metallurgical and scientific problems took place, and thanks were expressed for the hospitality of the firm.

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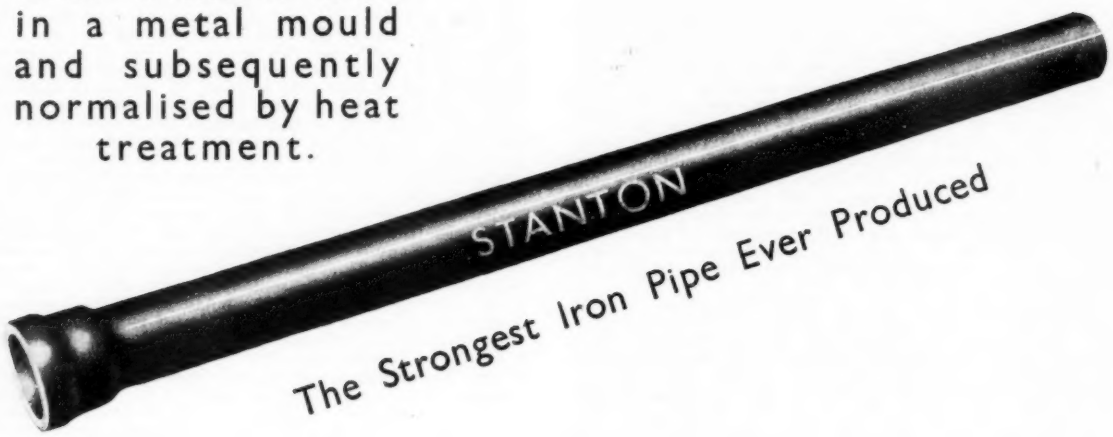
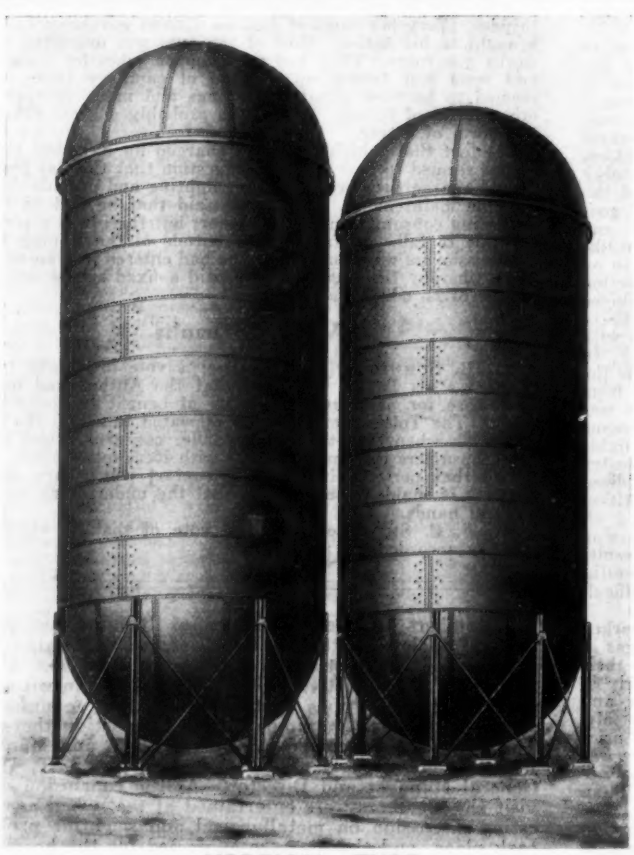


The Stanton Ironworks Company Limited, Near Nottingham



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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

The Stock markets last week continued firm and steady. Gilt-edged and home rails were prominent, a fillip being given to these sections by the success of the Railway Finance Loan, and a feature was the further rise in London Midland and Scottish (1923) stock to 65½. The Industrial Market, however, absorbed the major share of attention, the specialities being iron, steel, and aircraft shares, and though some profit-taking was in evidence towards the close the heavy demand quickly restored values. Confidence in home affairs at the present time is undoubtedly at a very high level, as is evidenced by the views expressed at the bank meetings last week, and though the foreign political situation is a disturbing factor, the conditions here are so favourable that any reactionary tendencies brought about by events abroad are speedily overcome.

More prominence was given to Gas stocks and shares last week by the very satisfactory report and accounts issued by the Directors of the Gas Light and Coke Company, which are commented on elsewhere in this issue. The result was an immediate increase of 6d. in the Company's £1 units, which closed at 28s., at which price the yield is 4%, a somewhat higher return having regard to present day monetary values and the security offered. Several other sharp rises took place on the London Exchange, and among these Alliance and Dublin ordinary headed the list with a gain of 10 points to 150, business being done at 150¼. Hornsey consolidated came next with a rise of 7 points to 139½, while Mid-Southern Utility and North Middlesex consolidated stocks were both hardened. The only set-back was in Imperial Continental, which dropped 4 to 181½. In the Supplementary List United Kingdom Gas Corporation 4½% preferred ordinary shares hardened 1s. to 21s., while it is interesting to note that business was recorded in Weymouth ordinary stock at 126½, though the nominal quotation remained at 110½. Quotations at the Provincial Exchanges continued unchanged.

Current Sales of Gas Products

The London Market for Tar Products.

Feb. 3.

There are no changes to report in the prices of tar products, which are as under:

Pitch, 43s. to 45s. per ton f.o.b.

Creosote, about 5½d. per gallon.

Refined tar, 4d. per gallon in bulk at makers' works.

Pure toluole, 2s. 9d. to 2s. 10d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, 1s. 8d. to 1s. 9d.; and 90/160 pyridine, about 4s. 9d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Feb. 3.

The average prices of gas-works products during the week were: Gas-works tar, 24s. 3d. to 29s. 3d. Pitch—East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 45s.* Toluole, naked, North, 2s. 2d. to 2s. 4d. Coal-tar crude naphtha, in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 6d. to 1s. 6½d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅜d. to 4⅞d.; low gravity, 4⅜d. to 4⅝d.; Scotland, 4⅝d. to 4⅞d. Heavy oils, in bulk, North, 4⅜d. to 5d. Carbolic acid 60's, 2s. 4d. to 2s. 6d. Naphthalene, £19 to £21. Salts, 95s. to 100s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Feb.* 1.

Comparatively quiet conditions have prevailed during the week, but, with distillers quite comfortably placed, prices remain steady.

Crude gas-works tar.—The actual value is 30s. to 31s. per ton *ex* works in bulk.

Pitch.—Practically no new business is being arranged, although quotations are maintained at 35s. to 37s. 6d. per ton f.o.b. Glasgow for export and 35s. per ton *ex* works in bulk for home trade.

Refined tar is valued at 2¾d. to 3d. per gallon at makers' works, according to quantity, and it is anticipated these prices will be maintained during the coming season.

Creosote oil.—The position is still on the balance and to-day's values are probably a fraction easier as under: B.E.S.A. Specification, 5¼d. to 5⅝d. per gallon; low gravity, 5¼d. to 5½d. per gallon; and neutral oil, 5¼d. to 5½d. per gallon; all f.o.r. in bulk.

Cresylic acid.—Fair quantities are changing hands at round the following prices: Pale, 97/99%, 1s. 5d. to 1s. 5½d. per gallon; dark, 97/99%, 1s. 3d. to 1s. 3½d. per gallon; and pale, 99/100%, 1s. 5d. to 1s. 6d. per gallon; all *ex* works naked.

Crude naphtha.—This being the off season supplies are on the short side and value is steady at 5¼d. to 5¾d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 4½d. to 1s. 5½d. per gallon, and 90/190 heavy naphtha is 1s. to 1s. 1d. per gallon.

Motor benzole is only available in small quantities at 1s. 3½d. to 1s. 4d. per gallon in bulk at makers' works.

Pyridines.—90/160 grade is 4s. 6d. to 5s. per gallon, and 90/140 grade is 5s. to 5s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole . . .	0	9½	to	0	10	per gallon at works
Motor ,, . . .	1	3	,,	1	3½	,, ,, ,,
90% ,, . . .	1	4	,,	1	4½	,, ,, ,,
Pure ,, . . .	1	7½	,,	1	8	,, ,, ,,

Contracts Advertised To-Day

Cocks and Brass Goods.

Halifax Gas Department. [p. 327.]
Stoke-on-Trent Gas Department. [p. 328.]

Gasholder and Tank, &c.

Oldbury Gas Department. [p. 328.]

Mantles.

Hereford Gas Department. [p. 327.]
Stoke-on-Trent Gas Department. [p. 328.]

Meters.

Blackpool Gas Department. [p. 327.]
Halifax Gas Department. [p. 327.]
Hereford Gas Department. [p. 327.]

Pipes, Specials, &c.

Blackpool Gas Department. [p. 327.]
Halifax Gas Department. [p. 327.]
Hereford Gas Department. [p. 327.]
Stoke-on-Trent Gas Department. [p. 328.]

Sand Blasting Plant.

Singapore Municipality Gas Department. [p. 327.]

Stores (Ironmongery, Tools, Tin Plates, Sulphuric Acid, Oils, Paints, &c.).

Halifax Gas Department. [p. 327.]
Hereford Gas Department. [p. 327.]

Vertical Retort Plant.

Batley Gas Department. [p. 327.]
Warrington Gas Department. [p. 328.]

Wash Coppers and Pans.

Halifax Gas Department. [p. 327.]
Hereford Gas Department. [p. 327.]
Stoke-on-Trent Gas Department. [p. 328.]

Trade Notes

Thermal Appliances, Ltd.

We understand from Capt. W. J. Liberty that he has severed his connection with Thermal Appliances, Ltd., of Fulham, of which he was a Director.

Stellite, Ltd., Order By-Product Plant.

Stellite, Ltd., Queens Ferry, nr. Chester, have placed orders for coal handling plant (150 tons per hour) with Spencer (Melksham), Ltd.; Stellite handling plant with Robert Dempster & Sons, Elland; electrostatic detarring plant with W. C. Holmes & Co., Ltd.; tar distillation and benzole recovery plants with the Chemical Engineering and Wilton's Patent Furnace Company, Ltd.

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* Repeat orders.

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STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 31.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,551,868	Stk.	Sept. 9	7	7	Alliance & Dublin Ord. ...	145—155	+10	150½
374,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	95—100	...	101½
557,655	,,	Aug. 12	7	7	Barnet Ord. 7 p.c.	165—170	...	...
300,000	1	Oct. 7	1 9½	1 4½	Bombay, Ltd.	1 5/16—1 7/16	...	27/6
178,480	Stk.	Aug. 12	9½	9½	Bournemouth sliding scale ...	222—232	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	171—176	...	174½
489,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	150—155	...	153—154½
50,000	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	85—90	+3	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	105—110	+2	107½
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	125—130	+2	...
357,900	,,	Aug. 12	7½	7½	Brighton, &c., 6 p.c. Con. ...	170—175	...	...
649,955	,,	,,	6½	6½	Do. 5 p.c. Con. ...	156—161	...	...
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	142—147	...	...
855,000	,,	Sept. 23	8	7	British Ord.	152—157	...	...
100,000	,,	Dec. 16	7	7	Do. 7 p.c. Pref.	153—158	...	...
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—101	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...	...
200,000	,,	,,	17 6⅔	3½	Do. 3½ p.c. Red. Deb. ...	98—100	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	Jan. 6	4½	4½	Do. 4½ p.c. Deb. ...	81—86	...	...
626,860	,,	July 22	6	6	Cardiff Con. Ord.	133—138	...	...
98,936	1	Sept. 23	2 -	2 -	Colombo, Ltd., Ord.... ...	1⅜—1⅝	...	...
24,500	1	,,	1 4½	1 4½	Do. 7 p.c. Pref. ...	20/—22 -	...	...
609,204	1	Oct. 7	-/11·48	- 11·48	Colonial Gas Assn. Ltd. Ord.	19/6—21/6	...	...
296,053	1	,,	1 3·30	1 3·30	Do. 8 p.c. Pref.	24/6—26/6	...	...
1,775,005	Stk.	Aug. 12	6	5	Commercial Ord.	100—105	...	103½—105
620,000	,,	Dec. 2	3	3	Do. 3 p.c. Deb. ...	85—90	...	...
286,344	,,	Aug. 12	5	5	Do. 5 p.c. Deb. ...	121—126	...	...
807,560	,,	Aug. 12	7	7	Croydon sliding scale ...	151—156	...	154—155
569,590	,,	,,	5	5	Do. max. div.	115—120	...	116—117
620,385	,,	Dec. 16	5	5	Do. 5 p.c. Deb.... ...	121—126	...	...
239,000	,,	Aug. 12	5	5	East Hull Ord. 5 p.c.... ...	109—112	...	...
181,625	,,	Aug. 12	6	6	East Surrey Ord. 5 p.c. ...	132—137	...	...
175,609	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
19,284,128	,,	Aug. 12	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	27/6—28/6a	+/6	27/6—28/3
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	89—92	...	90½—91
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	107—110	...	108¾—110¼
8,602,497	,,	Dec. 2	3	3	Do. 3 p.c. Con. Deb. ...	90—93	...	91½—92¼
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	117—120	+2	118¾—119
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	114—117	+1	115—116
270,466	,,	Aug. 12	6	6	Harrogate New Cons. ...	132—137	...	...
140,000	1	Sept. 23	1 7½	1 7½	Hongkong & China, Ltd. ...	1¼—1⅛	...	...
213,200	Stk.	Aug. 12	6	6	Hornsey Con. 3½ p.c. ...	137—142	+7	141½—142
5,600,000	,,	Nov. 4	14	8	Imperial Continental Cap. ..	179—184	-4	180—184
223,130	,,	Jan. 20	3½	3½	Do. 3½ p.c. Red. Debs.	91—96*	...	...
285,242	,,	Aug. 12	8½	8½	Lea Bridge 5 p.c. Ord. ...	175—180	...	...
165,736	,,	Aug. 26	10	8	Maidstone 5 p.c. Cap. ...	182—192	...	...
63,480	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	79—84	...	...
75,000	,,	Dec. 2	†10	†10	Malta & Mediterranean ...	200—210	...	...
					Metropolitan (of Melbourne)			
392,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	102—107	...	...
231,978	Stk.	Aug. 12	5	5	M.S. Utility 'C' Cons. ...	110—115	+2	111½
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	102—107	...	...
360,075	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
148,955	,,	,,	5	†5	Do. 5 p.c. Deb. ...	120—125	...	...
125,000	—	Jan. 2	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	96—99	...	...
675,000	Stk.	Nov. 18	†3	†3	Montevideo, Ltd.	58—63	...	60
225,000	,,	Aug. 12	7½	7½	North Middlesex 6 p.c. Con.	172—177	+2	...
396,160	,,	Aug. 12	5	5	Northampton 5 p.c. max. ...	105—110	...	...
300,000	,,	Nov. 4	†7	†9	Oriental, Ltd....	163—168	...	...
416,617	,,	Dec. 16	8	8	Plymouth & Stonehouse 5 p.c.	162—167	...	...
504,416	,,	Aug. 12	8½	8½	Portsm'th Con. Stk. 4 p.c. Std.	173—178	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	110—115	...	...
114,000	,,	July 22	5	5	Preston 5 p.c. Pref.	106—111	...	...
321,961	1	Sept. 23	...	1/-	Severn Val. Gas Cor. Ld. Ord.	22/—23/-	...	22/1½—22/9
319,510	1	,,	...	-/10½	,, ,, 4½ p.c. Cum. Pref.	21/9—22/9	...	22/—22/4½
133,201	Stk.	Aug. 12	5	8½	Shrewsbury 5 p.c. Ord. ...	147—152	...	...
90,000	10	May 27	‡3	‡3½	South African...	3—4	...	77/6
1,061,779	1	Sept. 23	1 2½	1 2½	South East'n Gas Cn. Ld. Ord.	27/6—28/6	...	28/3—28/6
845,016	1	,,	- 10½	- 10½	Do. 4½ p.c. Red. Cum. Pref.	22/3—23/3	...	23/-
200,000	1	,,	...	4	Do. 4 p.c. Cum. Pref. ...	20/9—21/9	...	21/3—21/6
450,000	Stk.	Aug. 12	4	4	Do. 4 p.c. Red. Deb. ...	100—103	...	...
6,709,895	,,	Aug. 12	6½	5	South Met. Ord.	132—137	...	134—136
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf....	148—153	...	151
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf....	105—109	...	...
1,895,445	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	88—91	+1	89—90½
1,000,000	,,	Jan. 6	5	5	Do. 5 p.c. Red. Deb.	113—116	...	...
1,543,795	,,	Aug. 12	6	6	South Suburban Ord. 5 p.c....	132—137	...	135—136
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	121—126	...	...
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	103—108	...	...
888,587	,,	Dec. 16	5	5	Do. 5 p.c. Deb....	123—128	...	...
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	103—108	...	...
415,907	,,	Dec. 2	...	4	S. Western Gas & Water Ord.	22/6—24/6	...	23/1½—23/6
160,523	,,	Oct. 21	...	...	Do. 4½% Red. Cum. Pref.	22/—23/-	...	...
110,000	,,	Dec. 16	4	4	Do. 4% Red. Deb. ...	98—103	...	...
647,740	,,	Aug. 12	5	5	Southampt'n Ord. 5 p.c. max.	115—120	...	...
121,275	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	98—103	...	...
350,000	,,	Aug. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	113—118	...	117
200,000	,,	Dec. 16	6½	6½	Do. 6½ p.c. Red. Deb. ...	96—101	...	...
94,000	,,	...	...	...	Do. 3½ p.c. Red. Deb. ...	96—101	...	...
1,076,490	,,	Aug. 12	6⅔	6⅔	Tottenham and District Ord.	150—155	...	153½—155
409,835	,,	,,	5⅔	5⅔	Do. 5⅔ p.c. Pref....	130—135	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	...
334,615	,,	Dec. 2	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
369,774	,,	Aug. 12	7	7	Uxbridge, &c., 5 p.c. ...	152—157	...	...
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	...	...
1,340,521	,,	Aug. 12	7	7	Wandsworth Consolidated ...	159—164	...	163½
1,371,373	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	126
1,317,964	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
499,735	,,	July 8	6⅔	6⅔	Watford and St. Albans Ord.	153—158	...	155—156
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	...
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	135—140	...	...
200,000	,,	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	98—103	...	...
100,000	,,	,,	...	3½	Do. 3½ p.c. Red. Deb.	96—101	...	...
158,400	,,	Aug. 12	6b	5	Winchester W. & G. 5 p.c. Con.	114—119	...	...

a.—The quotation is per £1 of Stock. b.—Paid £3, including 10s. on account of back dividends. * Ex div.
† Paid free of income-tax. ‡ For year. § Actual for three months.

Stock and Share List continued overleaf.

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Officer-in-Charge of Training, The Gas Light and Coke Company, Assistant Head of Department of Gas Engineering and Supply, Westminster Technical Institute.

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Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Jan. 31.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	July 22	6	5	Bath Cons.	123—125	...	...
1,667,250	,,	July 8	5	5	Bristol, 5 p.c. max.	119—121	...	...
120,420	,,	Dec. 16	4	4	Do. 1st 4 p.c. Deb. ...	102—104	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	102—104	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	125—128	...	...
274,000	,,	Aug. 12	5	5	Newport (Mon.) 5 p.c. max....	113—118	...	...
13,200	12	Aug. 26	8½	7	Pontyp'l Gas & W. 10 p.c. 'A.'	14½—15½	...	...
13,600	10	,,	6	5	Do. 7 p.c. 'B.'	11½—12½	...	...
40,000	10	,,	6	5	Do. 7 p.c. 'C.'	11½—12½	...	...
140,778	Stk.	Aug. 12	5	5	Weston-super-Mare Cons. ...	115—117	...	...
64,338	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	98—100	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	165—169	...	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Aug. 12	6½	5	Chester 5 p.c. Ord.	109—114	...	...
92,500	,,	Dec. 16	4	4	Do. 4 p.c. Pref.	100—105	...	...
32,540	,,	,,	3½	3½	Do. 3½ p.c. Deb. ...	91—96	...	...
41,890	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	100—105	...	...
2,167,410	,,	Aug. 12	6	6	Liverpool 5 p.c. Ord. ...	134½—135½	...	...
245,500	,,	Dec. 16	5	5	Do. 5 p.c. Red. Pref. ...	103—108	...	...
306,083	,,	Jan. 6	4	4	Do. 4 p.c. Deb.	105—107	...	...
106,280	,,	July 22	10	10	Preston 'A' 10 p.c. ...	206—216	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	142½—152½	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Aug. 12	8	8	Blyth 5 p.c. Ord.	151—153	...	...
732,000	,,	Aug. 12	5	5	Hartlepool G. & W. Co. & New	118—120	...	...
2,061,315	,,	Aug. 12	5¼	5	Newcastle & Gateshead Con.	25/3—25/9a	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	107—108	...	...
776,706	,,	Dec. 16	3½	3½	Do. 3½ p.c. Deb. ...	100—102	...	...
277,285	,,	Oct. 21	5	5	Do. 5 p.c. Deb. '43...	105—106	...	...
209,820	,,	Aug. 12	8½	8½	South Shields Con.	173—175	...	...
299,542	,,	Aug. 12	6	6	Sunderland 6 p.c. max. ...	129—131	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Aug. 12	10	7	Derby Con.	175—185	...	...
55,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	100—105	...	...
84,750	,,	Aug. 26	12	5	Long Eaton 'A' Ord. ...	150—160	...	...
50,000	,,	,,	10	4	Do. 'B' Ord. ...	130—140	...	...
20,000	10	June 7	5	5	Do. 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Aug. 26	10	10	Great Grimsby 'A' Ord. ...	220—230	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	220—230	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—215	...	...
1,736,968	,,	Aug. 26	6	6	Sheffield Cons.	143—145	...	...
95,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	100½—102½	...	...

a The quotation is per £1 of Stock.

Supplementary List of Stocks and Shares not Officially Quoted

60,000	10	Sept. 9	10	10	Ascot 10 p.c. max.	22—24	...	...
58,680	10	,,	7	7	Do. 7 p.c. max.	14½—15½	...	...
90,000	1	Nov. 4	5	5	Assd. Gas and Water Ord....	21/—23/-	...	...
90,000	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	21/9—22/9	...	22/6—22/9
17,000	Stk	Aug. 26	8	8	Bognor Orig. Ord. 'A' ...	164—174	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	164—174	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	142—147	...	...
37,440	,,	July 22	10	10	Cam.Univ. & Town 10 p.c.max.	214—224	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	161—166	...	...
39,025	,,	,,	5	5	Do. 5 p.c. max.	110—115	...	...
65,000	,,	Aug. 12	8½	7½	Eastbourne 'A' 5 p.c.	153—158	...	...
198,000	,,	,,	7	6	Do. 'B' 3½ p.c.	135—140	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	120—125	...	...
130,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	...	...
250,000	1	Nov. 18	...	4	Gas Consolidation Ord. ...	20 6—22/6	...	...
250,000	1	,,	...	4	Do. 4 p.c. Red. Cum. Pref.	19 6—20/6	...	19/9—19/10½
117,251	Stk.	Sept. 23	8 1/10	8 1/10	Gosport District Cons. ...	177—182	...	...
73,350	,,	,,	5	5	Do. 5 p.c. Pref.	113—118	...	...
24,000	30	Aug. 12	8½	8½	Great Yarmouth 8½ p.c. max.	53—58	...	...
59,400	30	,,	7½	7½	Do. 7½ p.c. max.... ...	43—46	...	...
51,160	Stk.	Dec. 2	5½	5½	Do. 5½ p.c. Deb.... ...	123—128	...	...
152,600	,,	Aug. 26	8	8	Guildford Cons.	175—180	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	116—121	...	...
68,250	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	120—125	...	...
156,600	,,	Aug. 12	7¼	7¼	Hampton Court Cons. ...	170—180	...	...
81,660	10	Feb. 4	5	9	Leatherhead Ord.	16—17	...	...
107,960	10	Sept. 23	5	4	Mid Kent Ord.	9½—10½	...	...
230,445	Stk.	Aug. 12	10	10	Oxford & District Ord. ...	215—225	...	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	117—122	...	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	115—120	...	...
126,193	,,	Nov. 18	7½	7½	Peterborough Ord.	160—170	...	167½
64,990	,,	Sept. 9	7½	6½	Redditch Ord.	116—121	...	...
66,850	,,	Aug. 12	7	7	Romford Ord.	167—172	...	...
160,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	...
44,000	,,	Sept. 23	5	5	Do. 5 p.c. Deb.	121—126	...	...
10,950	,,	Aug. 26	8	8	Ryde Ord.	168—173	...	...
136,191	,,	July 22	7	5	Scarborough Ord.	130—140	...	...
277,825	,,	Aug. 26	8	8	Shanklin & Ventnor Cons. ...	155—165	...	...
40,643	,,	Sept. 23	7	7	Slough Ord.	150—155	...	...
221,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	116—121	...	...
28,872	1	Nov. 4	5½	5½	S. Midland Gas Cpn.Ltd. Ord.	20/—22/-	...	...
28,866	1	Sept. 9	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-	...	...
24,930	Stk.	Aug. 12	7	7	Southgate & Dist. 7 p.c. max.	150—155	...	...
162,500	,,	,,	5	5	Do. 5 p.c. Pref.	117—122	...	...
17,228	,,	Aug. 12	6	5	Swindon Cons.	113—118	...	...
160,425	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	...	...
50,000	1	...	...	...	Utd. Kingdom Gas Cpn. Ord.	1 3/16—1 5/16	...	21/—22/-
760,910	1	Nov. 18	...	2½	Do. 4½ p.c. Prefd. Ord....	20/6—21/6	+ 1/-	20/9—21/-
110,910	1	,,	...	2½	Do. 4½ p.c. Cum. Pref. ...	20/6—21/6	...	...
900,000	Stk.	,,	...	...	Do. 3½ p.c. Red. Deb. ..	98—101	...	...
430,000	,,	Aug. 12	8	5	Wakefield Ord.	140—150	...	...
181,650	,,	,,	5	5	Do. 5 p.c. max.	103—108	...	...
82,000	,,	July 22	6	6	Weymouth Ord.	108—113	...	126½
70,000	,,	,,	6	4	York Cons.	107—112	...	...
390,000	,,	Dec. 16	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...	...
133,640	,,	Aug. 12	6¼	6¼	Yorktown (Cam.) 5 p.c. Cons.	120—125	...	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	117—122	...	...
35,000	,,	Dec. 16	5½	5	Do. 5½ p.c. Deb.... ...	126—131	...	...

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